LIBRARY
RECEIVED
JUN 20 1927
U. S. Department of Agriculture

Food Manufacture

A Journal devoted to the production and manufacture of:

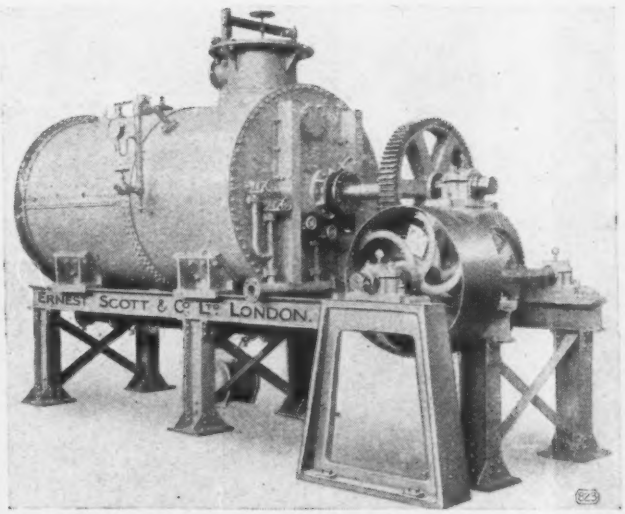
Chocolate, Confectionery, Biscuits, Bread, Cake, Beers, Cordials, Milk, and Invalid Foods, Tonic and Alcoholic Wines, Ice Cream, Patent Flours, Sugar, Preserved Fruits and Meats and Fish, Pastes and Extracts; Essences, Flavourings, Sauces and all edible commodities involving a process of manufacture.

Annual Subscription, 10/- (including postage). Single copies, 1/-

JUNE, 1927 Vol. I., No. 2.

Publishing, Editorial and Advertisement Offices:
173-5 FLEET STREET, LONDON, E.C. 4
Proprietors and Publishers: LEONARD HILL, LTD.

PLANT FOR THE UTILISATION OF WASTE FISH AND FISH OFFAL



COMPLETE PLANTS *for*

1. The **conversion** of white fish and fish offal to **Fish Meal** by the Scott vacuum process.
2. The extraction of oil from oily fish meal by the new **Scott "Patent" Extraction Plant,** converting products hitherto saleable **only as Fertilizer** into **Feeding Meals.**
3. The conversion of raw oily fish and fish offal to feeding meals and fertilizers in **one straight operation** by the Scott solvent process.
4. The rendering of fish livers by the Scott vacuum process for edible and technical oils.
5. The extraction of oil from liver foots by the Scott solvent process. **The most stringent sanitary regulations fully complied with. Maximum yields of oil and meal. Low labour and fuel costs.**

Scott's also manufacture plant dealing with waste animal products, hotel and restaurant waste, etc.

THE SCOTT PLANTS MAINTAIN THEIR PRE-EMINENCE

ERNEST SCOTT & CO. LTD., *Engineers,* BRADFIELD ROAD LONDON, E. 16
Also at 19 WATERLOO STREET, GLASGOW

"T & N" CORRUGATED FIBRE-BOARD CASES

PACKING THAT PAYS

PACKING can be a Source of Profit.

Is your Packing Department a dead load on your overhead expenses?

It should not be so.

A well-designed Fibre-board Packing Case, artistically printed in colour, attracts business.

Your Customers, the Retailers, like them because they are easy to store, easy to handle, look attractive and help them to sell the goods; besides which they eliminate the "Returned Empties" bugbear.

Even were "T & N" Corrugated Cases more costly than the old-fashioned wooden types they would still be worth while; they show an all-round saving in packing and carriage and, at the same time, give maximum protection against damage, pilferage and changes in temperature.

Other Progressive Firms have found our cases profitable, and we know that you will not be an exception.

Ask us straight away to make a sample to suit your requirements. No obligation will be entailed.

F.M. Dept.

THOMPSON & NORRIS
MANUFACTURING CO., LTD.
WILLESDEN LANE,
PARK ROYAL, N.W.10
AND AT WORPLE WAY, ACTON

Telephone: WILLESDEN 3442. *Telegrams:* "FIBROCASES, HARLES, LONDON."

Food Manufacture

THE JOURNAL OF THE FOOD INDUSTRY

Published every month at
173/5 FLEET ST., LONDON, E.C.4

Annual Prepaid Subscription, 10s. post free

Telephone: Central 8217. *Proprietors: Leonard Hill Ltd.*

Vol. I., No. 2

The editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings whenever possible.

June, 1927

CONTENTS

	PAGE
EDITORIAL COMMENTS	29–36
LETTERS TO THE EDITOR	36
TRADE NEWS	36
SCIENTIFIC CONTROL IN THE COCOA AND CHOCOLATE INDUSTRIES	37
FROZEN FRUIT FOR JAM MAKING	41
THE CONVENTION OF THE NATIONAL FOOD CANNING COUNCIL	42
MANUFACTURERS' PUBLICATIONS	43
THE MANUFACTURE OF SHREDDED WHEAT	44
FOOD PRESERVATIVES—THE PRESENT POSITION	47
FORTHCOMING ARTICLES	49
RECIPES	50
COMMERCIAL AND LEGAL NEWS	51
CURRENT LITERATURE	52
BOOK REVIEWS	53
BOOKS RECEIVED	53
RECENT PATENTS	54

An Imperial Canning Research Institution.

IN THE course of his presidential address to the Convention of the National Food Canning Council, Sir Edgar Jones urged the formation of a Central Imperial Research Institution whose primary function would be the co-ordination of the many-sided investigations now being carried out in almost every corner of the Empire. There is not the slightest doubt that a central station of this description would prove a potent factor in furthering the interests of the new home-canning movement. Under present conditions there is much overlapping, and the obvious advantages of co-operation and centralisation are lacking. Canning research requires semi-commercial plant, which is expensive, and to spend what the industry can at present afford in adequately equipping one station is obviously sounder policy than spreading it over a number of widely separated and necessarily ill-equipped laboratories.

Then, again, there is another good reason for adopting the suggestion. From every part of the world California has attracted students seeking instruction in the theory and practice of canning. The Fruit Products Laboratory attached to the University College of Agriculture at Berkeley is generously supplied with able teachers, laboratories, and plant. Here Professor W. V. Cruess and his associates provide courses of instruction to meet, as they themselves state, the growing demand for scientifically trained persons in the industry. What has been done in California can be done here; already we have an excellent nucleus, but it is only a nucleus.

Another outcome of the present position must not be overlooked. Californian graduates, whether they hail from Canada, Australia, or any other country, will naturally incline towards favouring American engineering firms with orders for whatever canning plant they may require.

German Information.

Dr. Hermann Serger, Director of the New Brunswick Research Station for the Preserving Industries, will contribute an important article to our July issue on "Wrapping Materials for Foodstuffs." This is to be followed, in August, by one on "Tinplate for Canned Goods."

British Research.

Lord Balfour states, in a short preface to a pamphlet dated January, 1927, issued by the Department of Scientific and Industrial Research upon the work of Research Associations under the Government scheme, that in the closer union of practical experience and scientific inquiry lie our best hopes for the material progress of mankind. He points out that research is most required when trade is bad and foreign competition is most severe, and adds: "The powerful and enlightened corporations of the United States and Germany are keenly alive to the necessity of turning to the

best account the scientific discoveries for which this age is so remarkable. They believe in the policy of research; they carry it out with courage, enterprise, and great resources; they take the long view, and they are richly rewarded."

The work carried out by the British Association of Research for the cocoa, chocolate, sugar, confectionery, and jam industries is passed under review. This Association has shown how it is possible to obtain a greater quantity of high quality crystalline sugar from a given quantity of sugar syrup than was previously obtainable. One manufacturer is effecting substantial savings by making practical use of this information. The Association investigated the cause of "bloom" of chocolate, and showed that it was due to the separation of the cocoa fat on the surface of the chocolate. Preventative measures were then devised, and are being applied by many firms. The cause of another form of surface defect of chocolates, the "sugar bloom," has been ascertained. Ways of avoiding the occurrence of mould, fermentation, and granulation in jams have been devised and put into practice. An instrument for testing the jelly strength of fruit and gelatine jellies has been devised. An important piece of work is the discovery of a method of preserving mincemeat without the use of prohibited preservatives. Finally, reference is made in the report to the work done by the Association in finding a way of obviating the bursting of chocolate-coated fondants during storage.

The Bursting of Chocolate-Coated Fondants.

Reference to British research on bursting fermentation calls to mind the investigations made by the United States Bureau of Chemistry into the same subject. It will be remembered that the American chemists traced the cause of the trouble to the formation of gas by the fermenting activity of various types of yeasts which are capable of living in sugar solutions of comparatively high concentration. As a preventative the Bureau advises the use of sufficient glucose (or, alternatively, invert sugar syrup) to produce a syrup of about 75 per cent. solids content, and to increase this to 79 per cent. or over by the addition of invertase to the fondant before the centres are moulded.

It is a matter of common knowledge that fondant consists of extremely minute crystals of sugar (sucrose) in a syrup of glucose and invert sugar. The proportion of solid to liquid phase can be varied. Firm fondants have a relatively high proportion of solid to liquid—over 6:1—and this condition is brought about by increasing the proportion of sucrose to syrup. On the other hand, with higher proportions of syrup the fondant becomes sufficiently fluid on heating to 60° or 80° C. ("remelting") to pour into starch moulds ("casting").

The experimenters found that although the yeasts responsible for bursting can live in highly concentrated solutions of sugar, nevertheless, there is a limit; if the percentage of sugar held in solution ("solids content") is over 80 per cent., conditions are unfavourable to their growth. The solids content of the syrup portion of fondant was found to vary from 70 per cent. in a fondant prepared from 93 per cent. sucrose to 6 per cent. glucose, to 83 per cent. in one prepared from 60 per cent. sucrose and 40 per cent. glucose. Increase in solids content is accompanied by an increase in syrup density and osmotic pressure. Bursting occurred in fondants of low syrup density—*i.e.*, those of low solids content. Thus high densities inhibit bursting fermentation.

High densities may be obtained by the use of a high proportion of glucose, or by addition of invertase ("convertit"). The action of invertase increases the proportion of liquid to solid and softens the fondant. In the case of fondants with fruit centres, which are especially liable to bursting fermentation, it is recommended to combine the use of a liberal quantity of invertase with a preliminary heat-treatment of the fruit at boiling temperatures without, however, in any way diminishing its flavour and other qualities.

Hand-rolled creams are much more liable to bursting than cast creams. This is due not to infection by the hands of the workmen, but to differences in solids content. Most firms are aware of the fact that much can be done to ward off the dangers of bursting fermentation by maintaining strictly hygienic conditions throughout all stages of manufacture.

Cooling Confectionery.

Conveying devices for cooling purposes form a part of modern bread-making plant. Machinery has now been designed and erected for a Glasgow firm for conveying cakes from the travelling-chain gas-fired ovens to the packing rooms. The carriers are supported by hangers travelling on the bottom flanges of I-girders, and the endless chain is of the Dodge "Cable" type. The carriers are made of mild steel, and are provided with angles on which the trays rest. The speed of travel is six feet per minute. The plant is driven by a 3-h.p. variable speed motor.

Vanilla.

Concentrated vanilla extracts are made by vacuum distillation of an extract of vanilla. C. B. Gnadinger has investigated the effect of this distillation on the flavour, aroma, and chemical composition of vanilla extracts, and has published an account of his work in the March issue of *Industrial and Engineering Chemistry*. He shows that when the extract is concentrated there is a loss of volatile acids and volatile oil, and a corresponding loss of flavour and aroma,

varying from 10 to 40 per cent., depending on the degree of concentration and kind of bean. This loss is not merely a weakening of the flavour, but is a change in the quality as well.

New American Food Colour.

A new green food colour, which has been named Fast Green F.C.F. (Colour Index 671), has been added to the two green dyes on the list of certified colours permitted by the United States Department of Agriculture for colouring foodstuffs and beverages. Fast Green F.C.F. belongs to the triphenylmethane group of acid dyes, and is similar in general composition to Light Green S.F. Yellowish and Guinea Green B., the two green colours already on the permitted list. The new dye is fast and non-fading when used in foodstuffs and beverages, whereas Light Green and Guinea Green fade rapidly. The new dye is also more intense than the other greens, and hence less is required for colouring purposes.

British Marmalade.

According to the view of the *Konserven-Zeitung* of May 4, the British Marmalade Industry has passed the peak of its production. It is pointed out that during the past few years the exports of marmalade from England have experienced a serious setback. In 1925, 113,000 cwts. were exported; in 1924, 128,000; in 1913, 184,000. Two-thirds of the exports go to the Colonies. Canadian and British-India imports have especially fallen away. On the other hand, the British imports of preserved fruits have grown considerably. It is also noted that British imports of honey have more than doubled in the past twelve years.

Fruit Candies.

Most candies are wholesome and have a definite food value; many are improved by the addition of fruit, and several excellent preparations consisting entirely or principally of fruit can be made. Professor W. V. Cruess and Agnes O'Neill have sent us the results of experiments carried out at the Californian Fruit Products Laboratory on the preparation of fruit candies.

An interesting example is "puffed" fruit fondant. K. McLeod found that the texture of fruit fondant could be greatly improved by adding during the heating process a small amount of baking soda. This reacts with the acid of the fruit to give carbonic acid gas, and results in "puffing" or "raising" of the candy, imparting to it a fluffy texture which is held when the candy hardens.

We give the recipe, together with one for popcorn-fruit crisp, on page 50. Other recipes supplied to us by the Fruit Products Laboratory are for candied and glacé fruits, fruit jelly candies, divinity fudge with fruits, chocolate fudge with fruits, panoche with fruit, fondants with fruit, fruit caramels, fruit nougat, fruit marshmallows, fruit brittles, and uncooked fruit candies.

Fruit By-products.

For a number of years Californian fruit growers have sought ways of profitably utilizing their by-products and surplus fruits. The surplus continues to grow in spite of the fact that large amounts of fruit are used every year in the manufacture of vinegar and fruit juice for local consumption, as well as in the preparation of jams, jellies, preserves, low-grade canned fruit, and so on. An attempt is being made to raise greater interest in the preparation of fruit juice concentrates, and with this object in view, J. H. Irish, of the Fruit Products Laboratory, has prepared a report which gives the results of laboratory and factory investigations conducted over a period of three years. It is pointed out that fruit concentrates can be easily transported and preserved for use in the manufacture of bottled carbonated beverages, sherbets, water ices, jellies, and confectionery of various kinds.

Fruit-juice Concentrates.

The aroma of fruit juices is largely attributable to volatile substances that are easily destroyed or driven off by heating, even at the comparatively low temperatures employed in vacuum distillation. This, of course, takes place in the early stages of the concentrating process. Concentration in open pans is not suitable if the product is intended for use in the beverage industry, since it leads to loss of flavour and colour, and often to caramelisation. There are many types of vacuum pans used for fruit juices. In the simplest form the liquid is steam heated under reduced pressure in a cylindrical tank. In the film evaporators the liquid travels up, or down, a series of steam or hot water jacketed pipes. In another type hot juice is sprayed into an evaporating chamber. Even under these conditions, as already remarked, there is a loss of volatile flavouring compounds, unless special provision is made for their recovery. Irish notes that M. K. Serailian, of San Francisco, has developed a continuous process by which the volatile portions are returned automatically to the concentrate.

It is stated that fruit juices concentrated to 72° Balling do not readily spoil at moderate temperatures. Some means of preservation is, however, desirable. Cold storage is preferred to pasteurisation; concentrates were stored at 30° F. for more than a year without noticeable loss of colour or flavour.

Freezing Fruit Juices.

Concentration by freezing was found to give products of better colour and flavour than the vacuum method, but the degree of concentration is not so high. In Gore's process the juice is placed in ice cans and frozen solid. The ice is broken up and then whirled in a centrifuge basket, whereby the syrup is separated from the ice. By two or three successive freezings and centrifugings, the juice is brought to 50°-55° Balling. The method has been used successfully in the Hawaiian Islands for making pineapple syrup.

Another process, the Monti process, is continuous and does not require the centrifuge; it is stated to be used commercially in Italy for the preparation of grape syrup. Irish and others have developed a process which entails the part freezing of the juice in non-corrodible cans, each fitted at the bottom with an air agitating device. Ice forms in the cans, leaving at the bottom the liquid syrup, which is siphoned off. A concentrate of 42° Balling was obtained by one freezing of juice that was originally 17° Balling; 40 gallons of juice yielded 12 gallons of concentrate.

Fruit-juice Powder.

In the above-mentioned report it is stated that the Merrill-Soule Company of New York has successfully reduced orange and lemon juices to powdered form by the spray process. According to tests made by Irish, the lemon powder is fairly satisfactory and could be used for carbonated beverages; the orange powder lacks flavour. This question of fruit-juice powder will be discussed at length by Dr. H. Lüthje, of Berlin, in our next issue.

Refrigerated Trawlers.

The proportion of our fish derived from voyages of over ten days amounts to more than 60 per cent. of the total, and the tendency is for that proportion to increase. The North Sea fisheries are in danger of being over-worked and depleted, and our vessels are going farther and farther afield. Out of these changed conditions has arisen the necessity for revising the present methods of storing and handling fish at sea. These were quite adequate when voyages were shorter and rarely lasted more than a week or so, but if distant waters are to be exploited and the catch is to be delivered to the consumer in first-class condition, then present methods will have to be either modified or else replaced by something quite different.

This opens up the whole fundamental problem of changes in fish and their control—changes in composition, structure, appearance, and so on, under normal conditions and under variously imposed conditions of low temperature. Considerable progress has been made in this field, although up to now the investigations have been largely of a preliminary and exploratory character. For this work, credit is mainly due to the Food Investigation Board. It has been shown that rapidly frozen fish can be kept for considerable time without detriment. More or less successful attempts have been made by engineers such as Ottesen, Piqué, Taylor, and Petersen to carry out fish-freezing on a commercial scale, but most of the trials have been made on land. There are cases, it is true, of trawlers having been fitted with refrigerating plant, but they have been abandoned. This has not discouraged other enterprising spirits; recently a German trawler has been fitted with brine-freezing plant, and, again, a motor twin-screw trawler has been equipped to carry out the Ottesen process.

It is quite clear that the question of mechanical refrigeration for relatively small boats has never been systematically explored, and it is equally clear that co-operative research under practical conditions is the quickest and least expensive way of arriving at a satisfactory solution. There can be no doubt that the time is at hand when trawlers will carry some form of freezing machine. Then they will be able to work distant waters and to deliver the fish in fresh condition at the ports.

Transport of Fish.

More urgent still is the need for research under practical conditions into the many complex problems of inland distribution. The present methods of handling fish on the quay after unloading and of transporting it to the consumer are bad, although no one is more anxious to improve them than the trawler owner and the merchant. The Food Investigation Board has established the fact that a dangerous rise in temperature takes place in fish left on the quay without ice, because millions of bacteria are propagated and their activity is only diminished by subsequent icing. It is quite evident that the temperature should be kept down during the whole period which elapses between catching and consumption. This means that a new system of handling fish on the quay, of packing it, and transporting it, will have to be worked out and ultimately put into operation. This involves the question of fish boxes, their construction, cleanliness, and the best methods of packing fish in them. It also involves the extremely important question of railway transport. The type of fish van used in this country is not suitable for carrying frozen or chilled fish. It has been shown that the inside temperature is not appreciably lower than that of the atmosphere. The vans used in France and Germany are very much more suitable for the purpose; they are insulated and non-ventilated.

The time is ripe for a really serious campaign of scientific research directed from the laboratory and conducted under practical conditions on board the

trawler and upon the quay. The scientists have scented blood, so to speak, whilst the industrialists are anxious to do anything within reason to improve upon present-day methods, and, incidentally, to enhance the popularity of fish as a food. What is needed, then, is direct contact and joint action, and the immediate provision of facilities for experimental work both at the ports and upon the sea.

Canadian Fish Research.

The National Research Council of Canada has just issued Report No. 19, which may be obtained at the Canadian Building, Trafalgar Square, S.W.1. Investigations were made to determine how the bacterial content of fish is affected by various conditions of handling and preservation. The report points out the dangers of improper handling, and indicates those conditions which will guarantee the preservation and delivery of fish in first-class condition for the market.

The flesh of fresh fish is sterile. The spoilage of fish is chiefly due to the method of handling after catching. When, as on the smaller trawlers, fish are allowed to lie at ordinary temperatures for an hour or more after being caught and are subsequently handled several times with pitch-forks, the bacterial content is greatly increased. Ordinarily the bacteria find ingress chiefly through the gills, but the pitch-fork holes provide an easier path for the bacteria, which come from the slime on the outside of the fish. When, however, fish are packed in ice as soon as caught, then dressed and frozen, they keep well for several months and have a low bacterial content. Halibut caught in the Pacific, frozen and shipped to Montreal, arrived in excellent condition. Mackerel keep fairly well when frozen, but deteriorate rapidly on being thawed. Cooking considerably reduces the number of bacteria. The relation between the bacterial content and other evidences of decomposition varies widely with different species of fish. Sixty-eight different organisms in fish have been isolated and identified.

Fish By-products.

The problem of avoiding waste in the fish industry may be approached from another angle. Waste or surplus fish can be turned into various products, such as fish meal, glue, gelatine, or isinglass, and oils. On the East Coast of Britain this by-products industry is well established. On the South and West Coasts there are a few more or less experimental plants for extracting oil, but they are incapable of dealing with the large quantities of by-products and glut of fish. Sir Frederic Nathan has drawn attention to the need for developments on a scientific basis. He states that at a Welsh seaport thirty tons of bream were thrown overboard because there was no market for it. If suitable plant had been available there could have been obtained from this seven and a half tons of meal, valued at £22 10s. a ton, and three tons of oil, valued at £48 a ton. With regard to liver oils, the usual practice in this country is to remove the cod livers on the trawlers and barrel them. On arrival at port these are sold to the East Coast oil factories, but they usually somewhat deteriorate before extraction. For this reason the oil extraction plant in the case of German trawlers is usually installed on board, with the result that their oil fetches £10 to £12 a ton more than the British product. The matter of a design of a simple and efficient oil extraction plant, and of its installation on board trawlers, is worth investigating.

Artificial Sausage Skins.

Ten years of continuous research at the Mellon Institute has resulted in a commercial process for the manufacture of sausage casings out of cotton linters. Strictly speaking, these artificial casings are thin-walled, seamless cellulose tubes, and it is claimed that they possess several advantages over the natural product derived from the intestines of animals. They are thoroughly hygienic, and can be made uniformly of any size and of any length. They are received by the packer in a dry condition, ready for use, and filling can be done more rapidly than with animal casings. Sausages so packed are perfectly comestible; they may be cooked in any manner and are eaten without difficulty. It is stated that in America there has existed, for some time, an urgent need of a synthetic substitute for the animal casings in general use.

The scientists at the Mellon Institute started their investigations in 1916, and it would be hard to find in the records of polar exploration an example of equally grim persistence in face of repeated failures and disappointments. One year was spent in searching for a lubricant that would enable a casing to be readily slipped on the stuffing horn. Finally, however, it was found that none was required, for the casings behaved best when dry. The raw material used for these synthetic casings is cellulose in the form of high-grade, purified cotton linters. This is transformed into the plastic condition by the viscose process, moulded into tubes, and reconverted to pure cellulose. The raw cellulose is treated with a 20 per cent. solution of caustic soda until it is thoroughly swelled, or mercerised. The excess of alkali is then pressed out. The shredded material is exposed to carbon disulphide vapours, thereby giving a bright orange product (cellulose dithiocarbonate), which dissolves in water to form the syrupy viscose. The viscose is then extruded from a pressure cylinder of monel metal in the form of a very thin tubular film, which is converted into firm and pliable cellulose by contact with a solution of ammonium sulphate. It was found that the character of the

finished product is very sensitive to small variations in a large number of factors, such as the grade of cotton linters, the concentration of the caustic soda solution, and the temperature and length of time employed in mercerisation. The dyeing of the casings presented difficulties, but these were overcome. Manufacturing on a large scale has been undertaken by the Visking Corporation of Chicago.

Soft, Oily Bacon.

First-class bacon for consumption in this country must be free from any tendency to softness. Danish bacon, from skim-milk fed pigs, is notoriously firm-fatted, and has set a high standard at which our pig-feeders must aim. The larger British bacon-curing establishments have spared no effort in an endeavour to arrive at a satisfactory explanation of the soft, oily character not infrequently appearing amongst the normal product of the factory. One of our contributors, F. W. Jackson, whose article on "The Raw Material of the Bacon-Curing Industry" appeared in the May issue of FOOD MANUFACTURE, has investigated this problem more completely than probably anyone else in this country, and has formulated certain theoretical considerations connecting the proportion of oil in the food with the softness of the pig-fat produced. These important results will be fully discussed in a forthcoming issue.

Meanwhile it is interesting to note that the Division of Chemistry, a constituent of the Canadian Experimental Farms, has spent three years in investigating the nature and causes of softness; this work involved the feeding of more than 300 pigs and the chemical examination of the fats therefrom. The Canadian investigators have found that the fat of soft, oily bacon contains a much larger proportion of olein than that of the normal, firm bacon; in the former the ratio of palmitin plus stearin to olein is 1:4; in the latter 1:1·75. The conclusion was reached that the fat of young pigs and animals of unthrifty growth is softer than that of finished pigs. Immaturity from whatever cause is a salient factor in the laying down of "soft fat." The character of the food is an important factor. Indian corn and beans fed injudiciously tend to produce soft pork. Fed in conjunction with skim-milk a considerable proportion of corn may be used without injurious effect. A grain ration, in equal parts of oats, peas, and barley, gave firm pork. Skim-milk promotes thriftiness and rapid growth with consequent firmness of pork.

The Canadian work, expressed in general terms, seems to show that a well-balanced ration is much less likely to cause soft fat in pigs than a badly-balanced one, though whether this effect is a direct or indirect one cannot at present be conjectured. If a ration is rich in both growth-promoting protein and mineral salts (as, for example, from skim-milk) the animal is probably so busy growing that he has no time to store up either the oil derived from his food or the fat which he has synthesised from starch!

Boron in Glass.

During the discussion which followed a paper on "Recent Progress in the Glass Industry," given by Professor W. E. Turner on March 7th, in London, Dr. G. W. Monier Williams asked what percentage of boron was used in chemical glass and also what were the possibilities of extracting it, as this was of great interest at the present time. In his reply, Professor Turner said that boron was a useful constituent of glass, but that there was a limit to its usefulness, as in some cases 5 or 6 per cent. might be the maximum which could be usefully employed; "Pyrex" glass had 12 per cent. The resistance of a glass diminished rapidly as the percentage of boric oxide increased much beyond 12 per cent. With a 25-30 per cent. content, it was possible, with hot hydrochloric acid, to extract all the constituents except silica.

The Tin Can.

The tin can does not, of course, pretend to be a perfect container, yet it has not been found possible to provide a commercial substitute; probably no such substitute will be found, and those connected with the canning industry are more interested in finding ways of minimising the chances of corrosion. In several quarters this problem is being very thoroughly investigated, and there are good reasons for believing that a solution will be arrived at before long. Corrosion shows itself in three ways: discoloration of the inside of the container, perforation, which causes holes in the cans, and solution or etching, which is the result of chemical action of the food product on the metal.

Two investigators, E. F. Kohman and N. H. Sanborn of the National Canners Association, have been making a study of the corrosion of cans by fruit juices. There is no relation between the acidity of fruits and their tendency to corrode the can; some of the least acid fruits are the most corrosive. The degree as well as the nature of corrosion is determined largely by depolarising agents or hydrogen acceptors in the fruits. Among such substances probably the colouring matter (the anthocyanin pigments) are the most important. Experiments were made with sheets of steel held in molten tin for various times and at various temperatures previous to passing through the coke pot, thereby obtaining various amounts of free surface tin and of tin-iron alloy at the junction between iron and tin; the conclusion was reached that an increase in alloy over present commercial practice is of no benefit and may even be detrimental. Tinned and untinned cans were

compared; practically all the untinned cans were hydrogen springers or swells by the time perforations had begun to show up amongst the tinned cans. As a possible explanation of the added protection afforded by a heavier coating of tin, it is suggested that the tin functions as a lubricant. The weakest points in cans are where the metal is subjected to a strain either in the various forming processes or at points where the can received dents due to rough handling. It is known that the draw of tin plate is influenced by the weight of the tin coat. A heavier coating may be beneficial largely in giving a more uniform draw and a less strained base plate.

Imperial Trade.

On March 10th the Agricultural Society in Trinidad tentatively approved of the plan to increase the consumption of cocoa by a worldwide advertising campaign, and asked the Chamber of Commerce and the Cocoa Planters' Association to co-operate with the Society in urging the Government to collect on behalf of the movement the proportionate contribution upon the cocoa exports from the Colony when required.

* * *

According to a report issued by the Canadian Bureau of Statistics, Ottawa, there were in Nova Scotia, in 1926, 132 lobster canneries, 101 fish-curing establishments, 7 clam canneries, 4 reduction works, and 2 sardine and other fish canneries. These employed 3,812 persons.

* * *

Dried fruit of every type can be produced in Australia, but the export trade is mainly limited to currants, sultanas, and raisins. The industry has expanded greatly as a result of soldier settlement. The industry at present has to meet on the British market severe competition from dried fruit produced under very low wage conditions in Mediterranean countries, and the heavy and fluctuating imports from California. The position of Australian canned and dried fruits on the British market continues to be completely dominated by American supplies. The immediate post-war difficulties arose mainly as a result of a number of firms inexperienced in fruit-canning entering the trade.

* * *

In the Bahamas the tomato industry, which was introduced a few years ago, is steadily growing, and promises to replace that of the pineapple. An effort is being made to revive the citrus fruit industry, which was very badly affected by the invasion of the blue grey-fly. Fish abound in the local waters, but there is no fishing except for local consumption. Formerly, bêche-de-mer was exported to China.

* * *

During 1926 dry, salted fish valued at £260,000 was imported into Jamaica, representing an increase of £18,000 over that for 1925. Imports of other foodstuffs were: Pickled mackerel, £68,325 in 1926 and £39,230 in 1925; wheaten flour, £590,287 in 1926 and £544,245 in 1925; condensed milk, £115,212 in 1926 and £105,585 in 1925; rice, £157,013 in 1926 and £136,145 in 1925.

* * *

Exports of copra from British Malaya during January and February amounted to 23,059 tons, valued at £495,528, as compared with 26,207 tons, valued at £619,591 in the first two months of 1926.

* * *

The exports of cocoa from the Gold Coast in April totalled 11,215 tons. In the Central Province the situation as regards cocoa is normal and prospects for the mid-season crops are fair. In the Eastern Province the mid crop will be light, but slightly better than last year. In the Western Province a slight increase is expected. In Ashanti the mid-season crop appears to be fair around Bekwai, but smaller around Kumasi.

* * *

Zanzibar has experienced difficulties from the collapse of the clove market. Although the market a month or two ago declined to 11 rupees per frazila, it recovered and has kept fairly consistently at about 13½ rupees recently. There has been an improvement in the state of the cloves coming in. Most of the 1926-1927 cloves have now been brought in and sold, and the total crop can be estimated at about 6½ lakhs.

* * *

A revised Customs Tariff came into operation in Trinidad on April 30th. The new rates for British Preferential Tariff are half the old rates for fish canned or preserved in jars or bottles (new rates, 2s. 1d. per 100 lb.) and for lard and substitutes (new rates, 2s. 1d. per 100 lb.).

* * *

The Natural Resources Intelligence Service at Ottawa has just prepared a bulletin on Canadian paperboard and cardboard. It is a complete industrial and commercial review. Copies can be obtained from the Canadian Building, Trafalgar Square, London, S.W.1.

Foreign Trade.

A canning plant for garbanzos or chick-peas is to operate on the west coast of Mexico.

* * *

German imports of coffee, fish, cocoa, meat, bacon, and lard showed a decline in February.

* * *

Last year the U.K. received from U.S.A. nearly two and a half million barrels of apples, or 78 per cent. of the total exported, and nearly three and a half million boxes of apples, or 48½ per cent. of the total.

Customs duties were reimposed from April 15th on certain animals and foodstuffs imported into Greece.

* * *

A Decree dated March 16th allows the temporary duty free importation into the French zone of Morocco of tinplate in sheets for making cans, etc., to be exported, whether full or empty, within a year.

* * *

The Uruguayan Customs Tariff relating to foodstuffs, including beverages, has been revised. Particulars may be obtained from the Department of Overseas Trade.

* * *

According to the report for 1926 on the industrial, commercial, and financial situation in Poland (published for the Department of Overseas Trade by H.M. Stationery Office, price 1s. 6d. net), there is a market in Poland for condensed milk, patent foods, packed oats, sauces, herrings, cocoa beans, tea, coffee, spices, and all kinds of essential oils.

* * *

The export trade of the United States in dried fruits was one of the most successful since the war, and amounted to roughly 363 million lbs., valued at 30 million dollars. Prunes and raisins form over two-thirds of the exports.

The following addition has been made to No. 34b of the Italian Customs Tariff: "Fish of any kind prepared and preserved in such a manner as to imitate prepared and preserved sardines properly so-called (*clupea pilchardus*) are assimilated to sardines and classed as such."

* * *

A report on the economic situation in Belgium in 1926 has been published for the Department of Overseas Trade by H.M. Stationery Office, price 4s. 8½d., post free.

* * *

Changes in the Customs duties have been made for cocoa, confectionery, preserved fish, condensed milk, and whole milk powder imported into British Guiana. Elaborate regulations have been issued by the Bahia Produce Exchange of Brazil to ensure the inspection and grading of cocoa.

* * *

The *Bollettino di Informazioni Commerciali* of March 12th contains a review of the Italian canned tomato industry. Exports are increasing; shipments during 1926 were double pre-war sales. The magnitude of the tomato industry is shown by the fact that 111,000 tons of canned tomatoes and tomato paste were exported in 1926; nearly one-half of this amount went to the United States and about one-quarter to Great Britain. British imports are on the increase.

Letters to the Editor

To the Editor, FOOD MANUFACTURE.

DEAR SIR,

With reference to the picture on page 15 of your volume No. 1, entitled "Death on the Doorstep," we have sent you, under separate cover, a sample bottle, and some details of the Wallis Safety Cap, from which you will see that we are far in advance of our American cousins with regard to cleanliness in milk.

This cap was put on the market last year, and immediately gained the Silver Medal for the best invention of the year at the Dairy Show at the Royal Agricultural Hall, since when it has been adopted by the majority of leading dairymen throughout Great Britain. This clearly indicates that the dairymen of England are just as wide awake as those of America to the necessity of obtaining the most hygienic package for milk.

We are, dear sir,
Yours faithfully,
THE WALLIS CROWN CORK CO., LTD.

To the Editor, FOOD MANUFACTURE.

DEAR SIR,

We shall be glad to have further particulars regarding "Fatty Oils as Substitutes for Ethyl Alcohol in Citrus Flavours," quoted in the *Current Literature* of the May issue of FOOD MANUFACTURE.

Yours faithfully,
"MANUFACTURER."

[The paper referred to was read by H. A. Schuette and B. P. Domogalla at a meeting of the American Chemical Society in May of 1926. Their investigations, which were quantitative, related to the development of rancidity in flavours having olive, corn, peanut, and cottonseed oils as vehicles. It was shown that rancidity had developed after 14 months to such a degree as to rule out any possibility of their commercial use. The consensus of opinion as to their use in cakes was that flavours which had been prepared with a fatty oil base were just as good, if not better, than the alcoholic extracts.—EDITOR.]

Trade News

Mr. C. S. du Mont, the London representative of the Karl Kiefer Machine Co., the Standard Sealing Equipment Corp., and others, has received an order from Wrigley Products, Ltd., of Wembley, for a Standard Sealing Equipment, comprising an automatic top and bottom gluing machine, together with a 16-foot compression Unit Sealing Machine.

Messrs. Prescott and Co., of Manchester, inform us that they now represent Charles Vermeire-van Geeteruyen, the Belgian rice manufacturer, for the sale of "Negress" Pure Rice Starch.

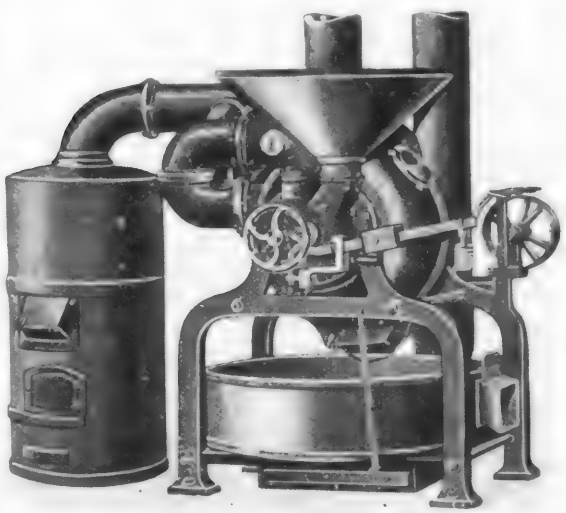
Scientific Control in the Cocoa and Chocolate Industries

By H. W. BYWATERS, D.Sc. (Lond.), Ph.D., F.I.C.,
Manager, Messrs. Slade and Bullock, Ltd., Dewsbury. Late Chief Chemist, Messrs. J. S. Fry and Sons, Ltd., Bristol.

PART I

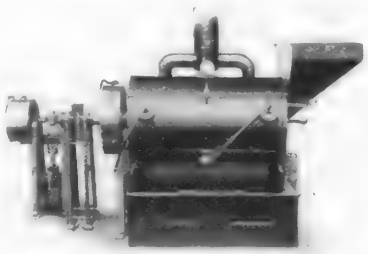
Scientific Control is simply another name for organized, systematic, and accurate control; it does not include guesswork, rule-of-thumb practices, opinions, or prejudices. It is based on trustworthy measurements by methods and instruments of unvarying precision, for one of its main objects is to detect and rectify, or make allowances for, variations in raw materials and manufacturing operations in order to ensure the production of standard products of high purity and quality. Such products, by their uniform excellence, are likely to secure and retain a steady popularity. But, quite apart from this consideration, the keen competition of to-day literally imposes upon the manufacturer the necessity of joining hands with the scientist in the constant struggle to reduce costs of production. The article below discusses the manufacture of cocoa powder from this standpoint.

THE KEEN competition and severe economic struggles of the last few years have driven manufacturers in every sphere of business to consider carefully the basic principles underlying the production of their goods and to seek to apply them so that, by increased efficiency, a loss might be turned into a profit and the business diverted from bankruptcy into prosperity. The manufacture of goods is daily becoming more of an applied science, and the help of scientifically trained men is being sought in the endeavour to secure a bigger return for the expenditure incurred.



"Sirocco" Patent Hot Air Roaster.
By the courtesy of Baker Perkins, Ltd.

In the cocoa and chocolate industries the engineer and the chemist are receiving now a recognition which was unknown a decade or two ago. The chemist is called upon to exercise functions of the most varied character. He has to take steps to ensure that the products sent out by his firm satisfy

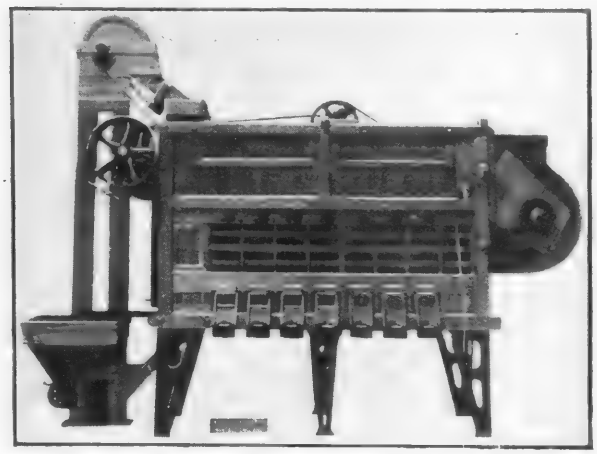


Improved Gas Cocoa Roaster.
By the courtesy of Baker Perkins, Ltd.

the requirements of the various Acts and Regulations regarding purity and freedom from unauthorised preservatives. He is also expected to be able to discover the cause of any fault in the goods which may become apparent either before or after they have left the factory. If he cannot discover the cause, he will be expected to put forward one or more theories to account for the fault, and show how it might be prevented. He may also be encouraged to suggest methods for improving the quality of the goods, or the processes of manufacture. But something more than this is required to-day from the chemist in the cocoa industry. He is encouraged to exercise a real control at various stages in the manufacture of the goods.

Scientific control has for its main object the manufacture of standard products, which, by their uniform excellence, are likely to secure and retain a steady popularity. The first step in this direction is the provision of raw products of standard quality. If we *start* right, there is some hope of reaching the desired standard in the finished article; but if the raw materials vary in quality from day to day, it can

scarcely be wondered at if considerable difficulty will be met with in attempting to reproduce the standard article. Definite specifications, therefore, should be carefully drawn up by the chemist for the



Winnowing Machine.

By the courtesy of Nalder and Nalder, Ltd.

ingredients of the various standard lines of his firm, and every fresh consignment of cacao, sugar, glucose, gelatine, agar, or what not, should be tested not only for purity but for quality, and, if not up to specification, the goods rejected or at least utilised for the manufacture of some cheaper line. In most factories it will be possible to have the quality of the raw materials checked before they are actually required for use, and to arrange that no raw materials are used for manufacturing purposes until they have been certified as up to standard by affixing to the container a ticket or label of one kind or another duly signed by the chemist or his deputy.

Raw Materials

For the manufacture of cocoa powder, comparatively few raw materials are required. Besides the actual cacao beans, we have to consider probably some kind of alkali carbonate for the treating process, flavours of various kinds, sugar for sweetened cocoa powders, and possibly starchy matters for the compounding of the cheap so-called "homœopathic cocoas." For all these substances definite standards should be set up, and variations allowed only between fixed limits. In some cases the tests to be applied should be of a practical as well as of a purely chemical nature. Flavours such as vanillin and coumarin should give the characteristic qualitative and quantitative values for the pure substances, but it is also helpful to compare the actual flavours in water or dilute sugar solutions of definite strengths. Samples of cinnamon bark, cassia, or the balsams may be similarly compared, and the results supplemented by determinations of the active flavouring principles present. Standards for flavours should thus be established, and subsequent consignments only passed for use after having been tested and found to be equal to the standard flavours.

The principal raw material, the cacao beans, should demand some attention. Not only should the "blend" be unaltered, but efforts should be made to maintain the quality of each type of bean employed. The presence of a small proportion of mouldy beans is likely to affect the flavour of the finished cocoa, whilst marked fluctuations in the content of cacao-butter may lead to difficulties in the pressing process, which may be reflected in an alteration in the quality of the final product.

Roasting

Coming now to the various stages in the manufacture of cocoa powder, it may be said that whereas in the old days the roasting of the cacao beans required the services of a "chef," the process has now been reduced almost to a question of temperature and time. If these are correctly controlled, the cacao will be found more uniform in quality than was the case when reliance was placed on the guesses of the expert. Modern roasting machines may differ from one another to a remarkable extent, and require corresponding differences in time and temperature; but they have reduced the roasting process to a science instead of an art.

Winnowing

The modern winnowing machine for removing the husk from the nib of the roasted cacao bean is also a triumph of engineering skill. Ton after ton of roasted cacao beans can be fed in at one end of the machine, and nib will flow from one side, and husk from the other, in streams of almost 100 per cent. purity. Actually the major portion of the nib will be found to contain less than 1 per cent. of cacao shell, whilst on the other side most of the shell will have in it less than 0·1 per cent. of nib. Under these circumstances, all that is required from the chemist is to check these figures from time to time, and to see that the proportion of "smalls," containing nib and shell in varying proportions, is maintained at as low a figure as possible.

Large Winnowing Machine.

By the courtesy of Nalder and Nalder, Ltd.

Battery of "Carver" Cacao-Butter Presses.

By the courtesy of Baker Perkins, Ltd.

Grinding

The reduction of the hard fragments of winnowed nib to a freely flowing liquid "mass" is accomplished by passing it through revolving stones or heavy steel rolls or refiners. The extent of the reduction should be checked by the microscope and by measurements of the fluidity of the "mass," which must be maintained between definite limits if it is to be conveyed or pumped into the presses or other receptacles for further treatment.

Pressing

The next process—pressing—is of all the manufacturing processes perhaps the most difficult to carry out with uniformity. Only by the most careful attention to the temperature, fluidity, and fat content of the "mass" can the correct amount of cacao-butter be expressed from it and a constant proportion of cacao-butter left in the press-cake. Yet the accuracy with which this process is carried out largely determines whether the final cocoa powder will be sold at a profit or at a loss to the manufacturer. Fortunately the development of chemical and physical methods has been such as to enable the chemist to estimate the cacao-butter content and the various constants with sufficient rapidity to enable him to keep a very close watch on the process, and it is really surprising what little variation will be found in some of the well-known brands of proprietary cocoa powders on the market. Whereas

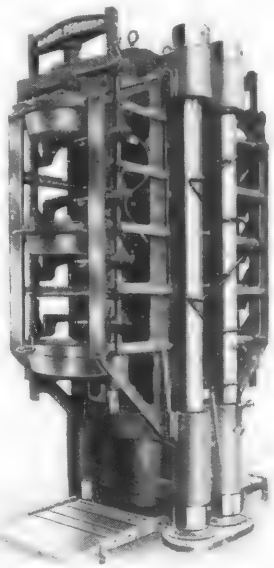
in the past variations of 3 to 4 per cent. in the content of cacao-butter were common, it is now seldom that a variation greater than ½ per cent. either way from the desired standard will be detected.

Treating

Probably the chemist will find his greatest opportunity in devising methods to regulate the so-called "treating" process which appears to be necessary for the production of a "soluble" cocoa such as is demanded by the British public at the present time. This "treatment" is essentially a chemical process, and a study of the changes which take place will be well worth while, because it is only when such changes are understood that it becomes possible adequately to control them. Treatment produces a marked effect on the colour and the flavour of the cacao, which are just those characteristics that determine its value to a discriminating public. Scientific control at this stage is, therefore, most desirable if a uniform product is required.

Two-Stone Cocoa Mill.

By the courtesy of Baker Perkins, Ltd.



"Carver" Patent Cacao-Butter Press.

By the courtesy of Baker Perkins, Ltd.

In a general article of this kind it is only possible to touch briefly on the various processes in the manufacture of cocoa powder, but sufficient has been said to suggest where scientific control has been or will be found to be beneficial. In a subsequent article some reference will be made to scientific control in the manufacture of chocolate.

(*Continued from next page.*)

oxidations. This has been demonstrated for cherries and plums, which when frozen in air are completely ruined by discoloration and changes in flavour. It has been shown that if these fruits are stored in an atmosphere free from oxygen (actually the oxygen was replaced by nitrogen) they can be frozen successfully, their normal flavour and colour being retained.

Not only can frozen fruit be used for jam making, but the fruit may actually be better for this purpose than normal fruit. A case is on record where strawberries that had been frozen made a splendid jam as they jelled without the usual difficulty. This was apparently due to extra acidity which had developed during storage.

Frozen Fruit from Colonies

The use of frozen fruit for the jam making industry opens up all manner of interesting developments. There is no reason why the Colonies should not supply us with vast quantities of raw materials. New fruits could be used, and many delicious jams such as Cape gooseberry, pineapple, etc., should find a ready market. At present such jams are manufactured in the Colonies and this necessitates the use of tins for transport. Frozen fruit grown in the Colonies and made into jam in England could, of course, be put into jars in the usual way. Thus the main prejudice against Colonial jams could be overcome, for it is a prejudice against the tin rather than the jam.

Frozen Fruit for Jam Making

By E. H. CALLOW, B.Sc., Ph.D., A.I.C.

If fruit could be frozen without in any way detracting from its original qualities, then all manner of interesting possibilities would be opened up. It would be possible, for instance, to carry on the manufacture of jam uniformly all the year round. Furthermore, it would enable vast quantities of frozen fruits to be transported over to this country from the Colonies for the use of jam makers. Amongst these fruits would be many delicious varieties, as yet practically unknown to Europeans, and their introduction would be attended by very desirable results. The problem of successfully storing fruits during the time required for transportation is receiving the attention of scientists. The article below discusses the main aspects of this problem.

THE MANUFACTURE of jam is still largely seasonal, owing to the fact that few fruits can be stored for any length of time. From the point of view of efficient organisation and of economy, this is a highly undesirable state of affairs. The ideal would be for jam making to proceed at a uniform rate all the year round. To the manufacturer such an ideal may appear fanciful, but to the scientist it merely represents the application to the jam industry of facts already discovered in the laboratory. Some fruits present little or no difficulty because they can easily be stored under ordinary conditions. The apple is the best known representative of this class. Others, like strawberries and plums, rapidly deteriorate if kept under normal conditions. Modern methods of cold storage can prolong the life of fruit to twice or three times its normal span. Whilst this is of great benefit in the case of the apple, whose life can be reckoned in months, it is of little use (to the jam industry) in the case of soft fruits whose life can only be reckoned in days. It is true that "carbon dioxide storage" may eventually play its part in lengthening the storage life of all fruit, but although the fundamental facts about it are well known, its application must wait until a more detailed scientific survey has been made. All fruit respires, that is it takes in oxygen from the atmosphere and gives out carbon dioxide. If the carbon dioxide content of a fruit store is allowed to increase, the fruit respires at a slower rate. This causes the fruit to go into a state resembling the hibernation of animals, and all its vital processes are slowed down. The fruit ripens at a slower rate, and the storage life of the fruit is consequently prolonged. The concentration of carbon dioxide in the atmosphere of the fruit store must, however, be controlled, otherwise it may become so great that the fruit is suffocated and dies. Each fruit and each variety has its own individual danger limit, which can only be determined by careful experiments. A greater handicap to the immediate practical application of the "carbon dioxide method" of storage is the enormous difficulty encountered in designing a gas-proof store, which is one of the essentials of the commercial exploitation of the method.

Effects of Freezing

The only remaining method of storing fruit for jam making all the year round is to freeze it. This can be done either with whole fruit or with fruit pulp. In any case, the result is that the fruit is killed, and on thawing it may deteriorate very rapidly. Some fruits withstand freezing and thawing remarkably well. In this category come red currants, which, if handled with care, are very little changed in appearance or flavour. Fruits like plums and cherries, however, are completely ruined by freezing. For on thawing they become badly discoloured and the flavour may have completely altered. For the sake of convenience, fruits may be divided into two classes, namely, those that can be used for jam making after freezing and thawing, and those that cannot. In the first class are the raspberry, blackberry, strawberry, red currant, black currant, and gooseberry, whilst in the second class the apple, pear, plum, greengage, and cherry occur. As might be expected, the fruits like plums, etc., which cannot be used after freezing and thawing, are those that show discoloration on injury, whilst those that can be used, such as raspberries and red currants, are not discoloured on injury. During freezing ice crystals separate out, and as ice occupies a greater volume than the water from which it is formed, it is not surprising that freezing injures the tissues mechanically. Since the tissues of certain fruits become discoloured on injury, these fruits will also be discoloured by the process of freezing and thawing.

Causes and Prevention of Discoloration

The reason for the discoloration of fruit is interesting. It has been shown to be due to the presence of an enzymic system, called the oxidase system. This system is capable of activating oxygen from the atmosphere, so that oxidations, and hence discoloration and change in flavour of the tissues, readily occur. Fruit which does not discolour on injury may owe its immunity to one of three causes. There may be an insufficient quantity of the enzymic system present, as appears to be the case with the strawberry. One constituent of the system may be lacking, and to this cause the raspberry owes its immunity. Or, lastly, an inhibitor may be present which prevents the fruit—*e.g.*, the gooseberry and red currant—from discolouring on injury. A knowledge of the cause of discoloration has led to a successful attempt to prevent the discoloration of frozen fruit. One of the factors involved is oxygen, and, theoretically, the exclusion of oxygen should prevent discoloration and changes in flavour of fruit which are due to

(*Continued on previous page.*)

The Convention of the National Food Canning Council

SIR EDGAR JONES' PRESIDENTIAL ADDRESS

Although founded only a year ago, the National Food Canning Council has already made remarkable headway in promoting the expansion of British canning. The Council has succeeded in welding into one active organisation the growers, the tinplate manufacturers, the can-makers, the canners, and the distributing agencies. The consumption of canned foods in this country has attained considerable dimensions, and is capable of being enormously increased. At present we are dependent on the United States for a large part of the supply—a point that was brought out by the figures quoted in last month's issue of FOOD MANUFACTURE. *Clearly, there are great possibilities, and, indeed, great opportunities, of building up a home industry which will bring no small measure of prosperity to growers and manufacturers alike.*

SIR EDGAR JONES, K.B.E., the chairman of the National Food Canning Council, presided over its first convention at Cardiff on May 20th. The conference was held at the Engineers' Institute, and among the delegates were representatives of British firms from all parts of the country engaged in the growing, canning, and distribution of fruit, vegetables, and other foods, together with the heads of the tinplate works in South Wales which produce the plate used for the containers.

Sir Edgar Jones, in his presidential address, explained that the convention embraced representatives of producers and manufacturers—growers, canners, can-makers, tinplate manufacturers—together with the Ministry of Agriculture, various research institutions, and some distributors. It represented a combination of the various interests that must contribute towards the establishment of a large canning industry in this country. The co-operation secured by such a combination had yielded important results during its first year. The canners, especially, had shown considerable enterprise.

New Developments

Nine complete installations of the most modern plant had been purchased, and were coming into operation this season for the canning of fruit and vegetables. Of these, four might be described as new factories, and one of them was a factory to operate for the first time in this country the highly specialised modern plan for the mass treatment of peas. The can-makers had installed new machinery, the tinplate manufacturers had contributed substantially with financial and active support, the growers had been extending their planting, and the Ministry of Agriculture and the research organisations had extended their valuable activities.

Benefits to Agriculture

Comparisons with other countries, after making all relevant allowances, showed that there ought to be in a few years an additional 50,000 acres growing peas for canning in this country, another additional 50,000 acres growing vegetables for canning, and a considerable increased acreage growing fruit for canning.

In this country also, as in every other country, the existence of a cannery would not only maintain

existing growers on the land, but bring back numbers of growers who had given up in despair. It would also in time attract substantial new capital to the fruit and vegetable industry. The result would be that the grower would have an assured minimum market that would enable him to do better in the fresh fruit and vegetable market, and improve the existing defective distribution, which would be for the benefit of the health of our industrial population.

British Imports

The fiction that the attitude of the people of this country towards canned foods was different from that of other countries had been already effectively disposed of. The fact was that in the last normal year (1925) we imported canned foods into this country to a value of £25,382,296, or, in weight, 8,194,991 cwts. Of this large importation less than £5,000,000 worth came from British countries, and £13,000,000 worth from the United States of

America, mainly in the form of canned fruits. After a careful review of the figures it was shown that in the form of food containers we imported 100,000 tons of American tinplate into this country every year.

Home Canned Fruits

The grocers and the public were not being asked to accept an inferior article, or pay any premium of price; it had been declared by foreign experts that the home-grown fruits canned in Britain were equal in flavour and in every other way to the best produced anywhere in the world, and the canners were marketing them at competitive prices without any special charges or bounties from the Government. By assisting British agriculture and British industry the people of South Wales would be contributing directly to their own industry and employment.

Imperial Plan of Research

It was worth a great combined effort to explore the possibilities of practical and economical means to enable home growers to protect themselves against the frost peril as growers elsewhere had had to protect themselves. There was still in this country too much of a tendency on the part of people to expect that after they have put up a tree in the ground Providence will for the rest of their lives yield them what they pray for.

Thanks to the research that had been carried on and the helpful activity of the Horticultural Department of the Ministry of Agriculture, British growers in certain districts had, during recent years, advanced a great deal in the adoption of scientific methods of treating the soil, lay out, and planting, pruning, spraying, picking, sorting, etc. But there was a great deal to be done before growers as a whole could claim to rank with the growers in other countries. The building up of a Central Imperial Research Institution that would co-ordinate the work of research and guide, assist, and stimulate improvements in the industry was most desirable. Given equal scientific treatment, the same persistent, ceaseless attention and care, the same organisation of precautions and aids, a grower on the average of years had equal security in the British climate so far as concerned the special fruits that they were mostly concerned with.

Marketing Canned Foods

The big-scale canning of vegetables provided a wider range for balancing good and bad fruit years. There was an enormous market in peas and other vegetables awaiting development. Here the competition of imports was comparatively small. The American pack of canned vegetables in 1925 reached the enormous total of 2,710,000,000 pounds weight, including 396 million cans of peas and 48 million cans of spinach. Spinach was recognised medicinally as one of the most valuable foods for the health of children and adults. It grew well in this country, but he mentioned with confidence the assertion that not more than five per cent. of the industrial masses of South Wales ever had spinach on their tables. It was cleaned better in the power plant of a cannery than in the best hotel, and it was cooked better in the closed can because of the absence of oxygen that destroyed valuable vitamins. The canners of America had taught their people to eat even sauerkraut in huge quantities. We should be able to teach our population to consume canned spinach, peas, and other vegetables.

It took a long time to get British people to combine and to make an effort on new scientific lines, but once they were combined they could successfully compete with the best in the world.

Manufacturers' Publications

Cocoa.—A beautifully illustrated booklet of 48 pages, commemorating the fourth century of the introduction of chocolate into Europe. It gives a most interesting account of the early history of cocoa and chocolate, a description of the cultivation of cocoa, and data bearing upon the production and consumption of cocoa.—Cadbury Brothers, Ltd., Bournville.

Standard Sealing Equipment Corporation.—A well-illustrated catalogue of the Standard Automatic Sealing Machines. This machine automatically performs the operations of opening the flaps of boxes, applying a thin, even film of adhesive upon both top and bottom outer flaps, and refolding them into proper position without disturbing the contents. The sealing follows when the case enters the compression or sealing unit.—C. S. du Mont, Windsor House, Victoria Street, London, S.W.1.

Emulsors.—A leaflet giving particulars of the Anchor and Defiance Emulsors, designed to meet the needs of confectioners, bakers, etc., for making cream and milk from the Anchor Milk Powder and unsalted butter.—The New Zealand Co-Operative Dairy Co., Ltd., Adelaide House, King William Street, London, E.C.4.

Die Exportindustrie in Braunschweig.—A publication of 88 pages, in three languages, giving an interesting account of the industrial and commercial activities of Brunswick in Germany. This State is one of the main centres of the German food and tinplate industries. This handbook has been issued "to renew former business relations and to further new connections between Brunswick and foreign firms." It represents an effective form of advertising.—The Chamber of Commerce of Brunswick.

FOOD MANUFACTURE is sent to any address in the World for 10s. per annum. Send your subscription now to LEONARD HILL, LTD., 173, Fleet Street, London, E.C. 4.

The Manufacture of Shredded Wheat

A NOTABLE example of a modern food factory, designed, equipped, and operated on lines embodying the latest developments to ensure production at maximum efficiency, is that of the Shredded Wheat Factory at Welwyn Garden City, Hertfordshire. Situated in rural surroundings, this factory is equipped with every convenience to ensure economical production under the most hygienic conditions, and every attention is given to the comfort and well-being of the operatives. All operations are so co-ordinated, and the organisation is so thorough, that there is no unnecessary handwork—machinery and up-to-date handling drives being utilised for every stage of manufacture from the point of delivery of the wheat to the despatch of the final product.

The entire plant is driven by electric motors, full advantage being taken of their adaptability to all requirements so that in every instance the most suitable drive is installed. Moreover, by means of individual driving stand-by power losses are eliminated, and the only line shafting required is that actually forming part of a complete machine or plant unit. Thus, full advantage is taken of the spaciousness, airiness, and excellent lighting provided by the design of the structure, and, in order to ensure a high standard of illumination at night time, an electric lighting equipment in which B.T.H. lighting fittings and Mazda lamps are used has been installed so that work may be carried out as efficiently after sunset as during the hours of daylight.

All the motors, control equipments, switchgear, etc., were manufactured by the British Thomson-Houston Co., Ltd., Rugby, and the complete installation work was carried out by Messrs. Electric Installations, Ltd., London.

The power circuits are at 415 volts, three-phase, 50 cycles, and the lighting circuits at 240 volts, the electrical energy being transformed to this pressure in a sub-station from the extra high tension mains of the Welwyn Garden City Electricity Supply Co.,

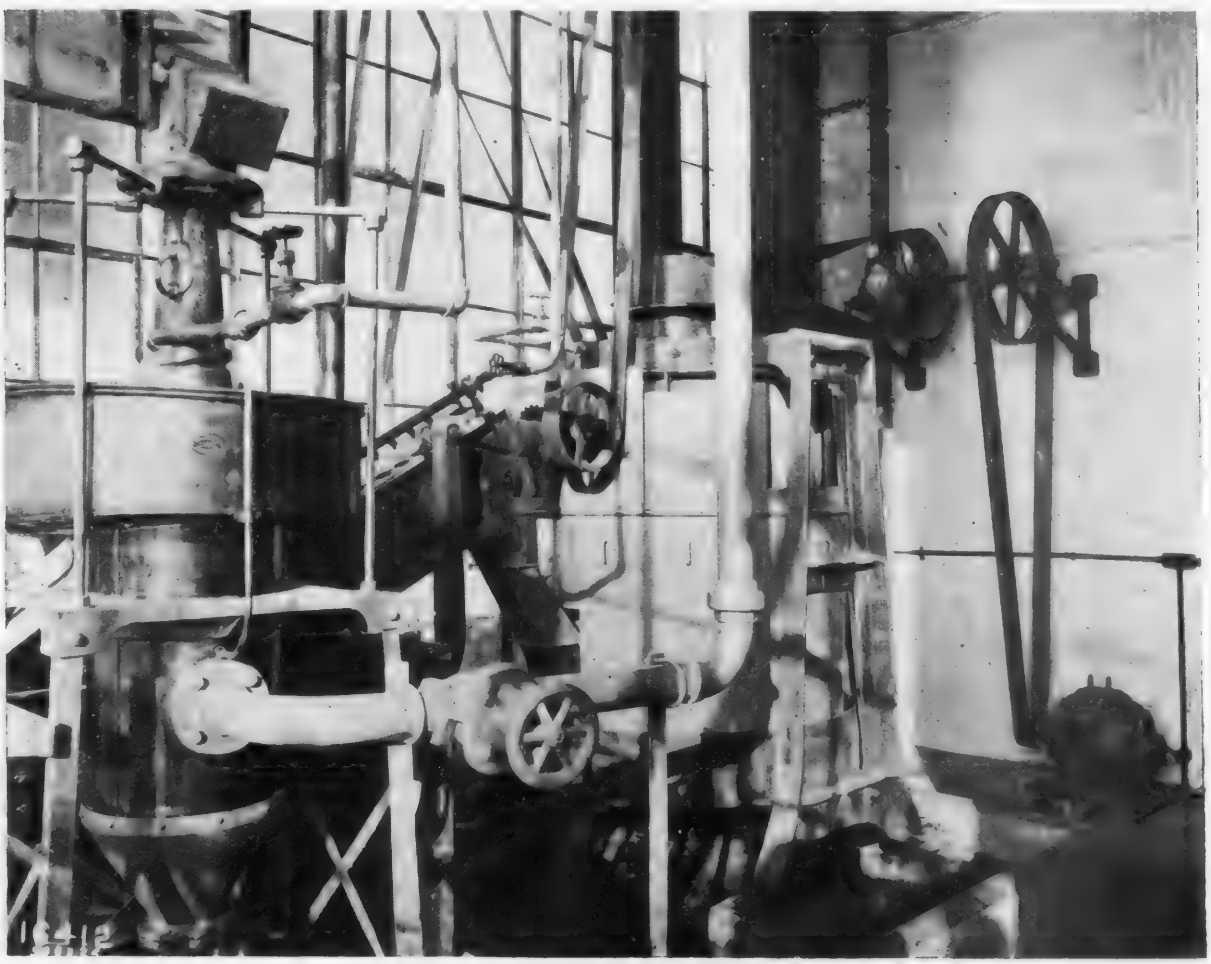


Fig. 1.—"Mersey" Wet Wheat Stoner.

Fig. 2.—Wheat Cleaning Plant.

Ltd. The main switchgear units are of the British Thomson-Houston Company's well-known Truck type.

Some idea of the processes to which the wheat is subjected and the methods employed by the Shredded Wheat Company may be gathered from the ensuing brief description and the accompanying illustrations. In the first place, the wheat, which by the way comes from Australia, is subjected to ten separate cleaning operations; it is then cooked by steam for twenty-five minutes in steel vessels, dried, shredded, baked, and then finally dried for fifty minutes in steam-heated ovens, through which the "biscuits," as they are called, slowly progress from the receiving to the delivery end. In addition to the special machinery used for the foregoing operations, various conveying systems transport the wheat from process to process, while unique equipment is used for packing the "biscuits" in practically air-tight cartons, which again are packed into strong cardboard containers. The storage is on the floor above the packing room, the containers being made up as required, wire stitched on automatic machines driven by fractional horse-power motors, and delivered to the packing tables *via* a gravity chute. When packed, these containers are closed, the lids stitched on other automatic machines, and delivered by motor-driven conveyors to store, whence they are taken, as required, by another conveyor system direct to any one of a line of covered railway waggons, or to the van dock, if for delivery by motor lorry.

Views of the wheat cleaning plant are given in Figs. 1, 2, and 3. In Fig. 1 is seen a "Mersey" Wet Wheat Stoner; two B.T.H. squirrel cage induction motors drive this plant, the one shown being of 7½ h.p. and the other of 5 h.p. Two similar B.T.H. motors are employed in the Wheat Dusting System; the larger one is rated at 5 h.p., and drives by belt a Sturtevant fan in connection with the wheat dusting system. The 3 h.p. motor fixed to the ceiling drives through a Westinghouse-Morse chain to a 3-inch conveyor and elevator. In the section of the wheat cleaning plant illustrated in Fig. 2, there may be noted four B.T.H. motors. From left to right these are as follows: 1 h.p. driving an elevator, 7½ h.p. driving No. 6 separator, 3 h.p. driving No. 3

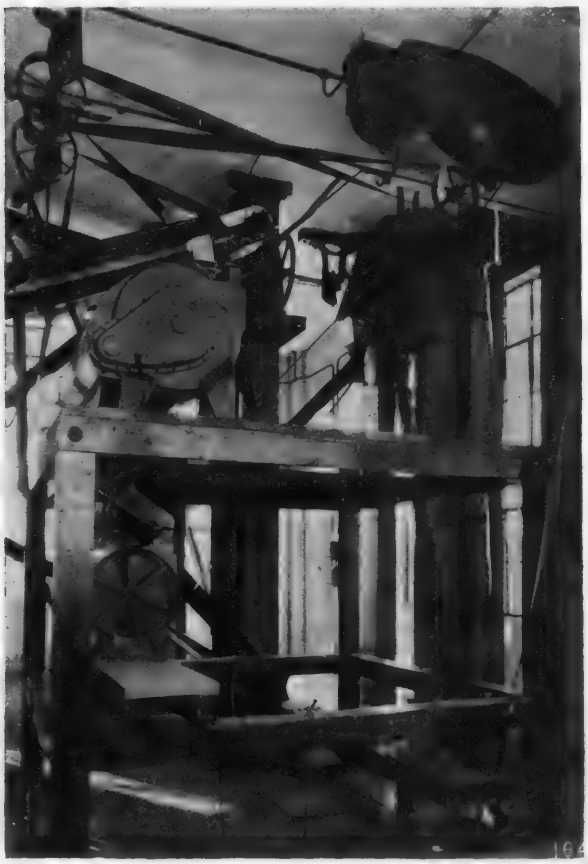


Fig. 3.—Wheat Cleaning Plant.

separator, and 1 h.p. driving an elevator. Another glimpse of the wheat cleaning plant is obtained by Fig. 3, showing two of the driving motors rated at 1 h.p., and 7½ h.p. respectively. The former drives an elevator and the latter shafting through a Westinghouse-Morse chain. The machinery driven from this shafting comprises two 8-inch worm conveyors, two "Carter Mayhew" disc separators, and an elevator. Near the wheat cleaning plant is a 1 h.p. motor with Westinghouse-Morse chain and spur wheel gearing drive to an elevator; near the "Avery" automatic weighing machine is another B.T.H. motor of 5 h.p., with belt drive to an exhaust fan, which removes wheat dust from the weighing machine, while the third motor, at the back, drives by belt another exhaust fan. This motor also is of 5 h.p.

The machine which actually shreds the wheat and delivers the complete shredded product ready for baking is shown in Fig. 5. The B.T.H. motor, which is of 50 h.p., is of the slip-ring type, fitted with short circuiting and brush raising device, and the drive is taken through a Westinghouse-Morse chain. Behind the motor may be seen the B.T.H. motor starting pillar, type ATP, and it should be mentioned that "stop" push buttons are provided at suitable points on the shredding machine so that the operator can instantly cause the machine to stop working should this be necessary at any time. In fact, this remarkably convenient method of controlling electric motors is often utilised where the driven machinery is such that the ability to stop it from one or more points is a valuable feature.

A view of the conveyor systems, previously mentioned, is shown in Fig. 4. This illustrates the beginning of the conveyor, which is the means whereby the containers full of Shredded Wheat are despatched from the stores direct to the railway vans, or loading platform for road delivery. The motor, which is of the squirrel cage type, is rated at 2 h.p., and it is interesting to note the method of mounting the stator switch and star-delta starter. This method is standardised throughout the factory; in some instances the starters are mounted near their motors, and in others it is more convenient to mount the starters in groups so as to facilitate the control of equipments working in conjunction with one another. In addition to the drives mentioned, others include those for Babcock and Wilcox chain grate stokers, air compressors, etc., B.T.H. motors being used throughout.

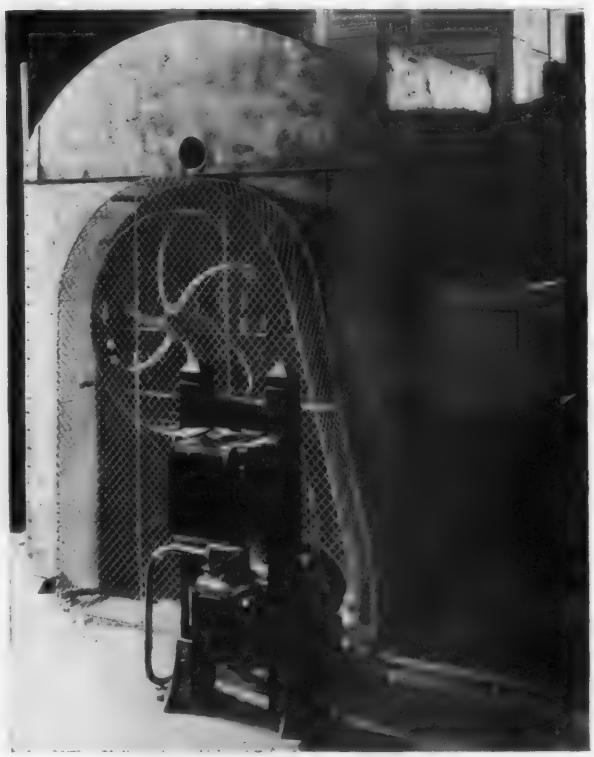


Fig. 4.—Despatch Conveyor.

Food Preservatives—The Present Position

By H. R. JENSEN, M.Sc., F.I.C.

Published in our last issue, an article by Dr. Drake-Law on the estimation of preservatives in foodstuffs has attracted considerable attention. This article gave evidence in support of the contention that no really satisfactory method of estimating accurately the sulphur dioxide content of foodstuffs has yet been devised. The author critically examined the commonly used methods, and concluded that they gave unreliable and inaccurate results. The article below, after discussing several important aspects of the new Public Health Regulations, shows how it is possible to estimate sulphur dioxide with very considerable accuracy.

DR. DRAKE-LAW recently gave in these columns an excellent review of the pitfalls and difficulties which the analyst may experience in accurately estimating preservative sulphur dioxide in a varied range of food products. Nevertheless, as indicated later in this article, it is now possible to estimate this substance with very considerable precision in all its typical admixtures.

Two chemical preservatives only, benzoic acid and sulphur dioxide, have been permanently retained as permissible for use in food materials—boron compounds, of course, finally disappearing on July 1st, 1928. The regulations scheduling the use of these substances are an exceptional instance of legislation definitely preceding the perfection of an analytical technique capable of exactly controlling such chemical admixtures. The question of estimation was not on the terms of reference of the Departmental Committee, and it is not surprising that the Ministry were not ready to comply with their wish to prescribe standard methods of analysis. By March a comprehensive report on benzoic acid determinations (Monier-Williams) was published by the Ministry. It is unlikely, however, that this will enable inaccuracy always to be overcome in the case of certain products. As regards sulphur dioxide, this also is to

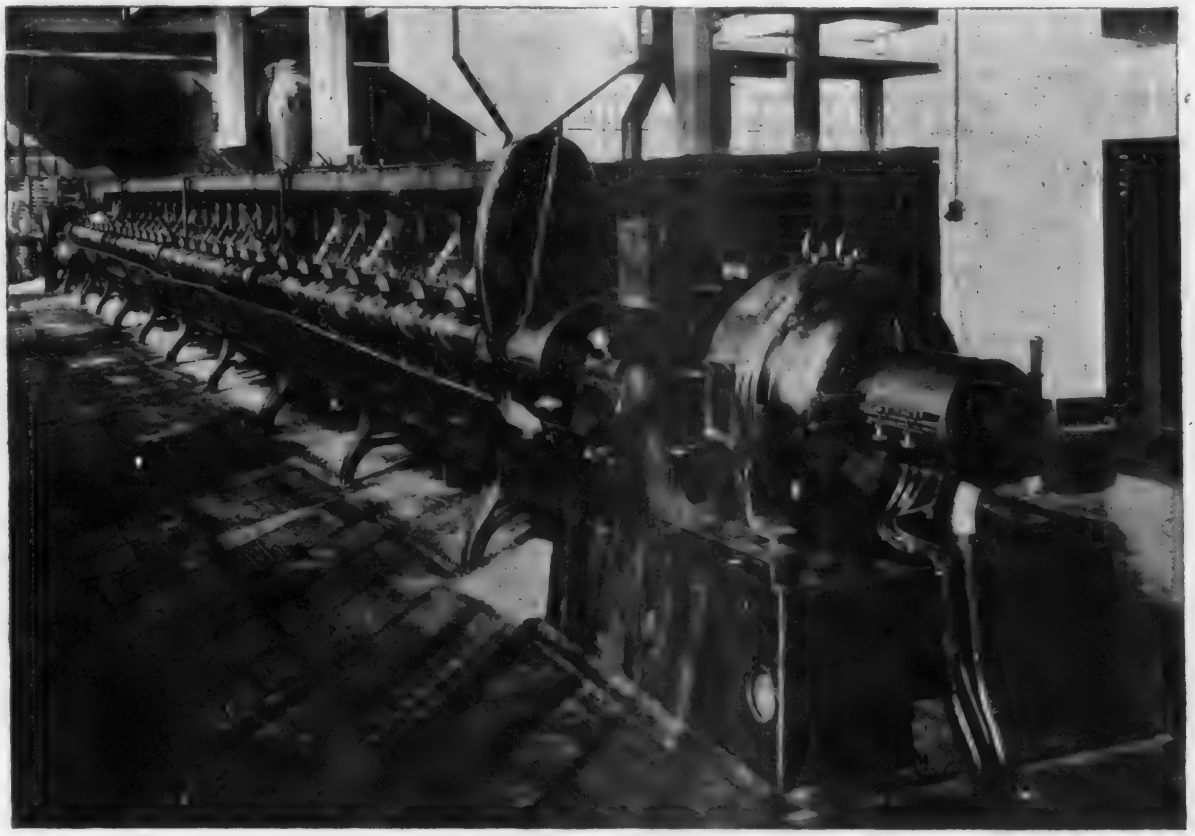


Fig. 5.—Shredding Machine.

be the subject of a similar official publication, again, of course, of an advisory character, and obviously not binding on any chemist who may have devised more perfect procedure, which is not at all unlikely in specific directions.

The Regulations

As for the regulations themselves, as finally amended to April, 1927, and the findings of the Departmental Committee, there has been little open discussion. Although it will serve no immediate practical purpose, some technical comment on these decisions is still of general interest.

The regulations as a whole now in being can certainly be described as thorough and effective. They are supremely just and fair to the various apparently conflicting factors of public health, cost, and technical practicability. Nothing better or wiser has yet been done by other nations. It is not possible to give a department, nor even a Government, any particular credit, for, as a member of that Manufacturers' Consultative Committee which sat so frequently from August, 1923, to November, 1926, and sifted every technical and commercial necessity bearing on the use of food preservatives and colours, the author can testify to the very hard work and argument that had to be brought to bear in order to ensure that the proposed regulations should have anything like their final excellence. The worst that may now be said is that there are apparent inconsistencies and several unnecessarily high sanctions, but these flexibilities arise from meeting actual facts rather than from rigidly adhering to some pre-supposed safe dose of preservative. All the proved demands of the various trades have now been reasonably met in the latest supplement, permitting small amounts of sulphite necessarily present from the manufacturing processes of corn flour and starch; and this amendment legalises the needs of certain intermediate products not consumed as such. The exclusions finally adopted, it may be noted, are precisely those very wisely advocated by the witness for the British Medical Association. This source would not always imply that the science of biochemistry was the basis of the evidence, but in this case all chemists will agree with the prohibition of fluorides and formaldehyde.

Food manufacturers were optimistic enough to suppose that the schedule would not be drawn up condemning the use of any preservative except in specified articles—the opposite policy to the decision with colours—but in this respect they overlooked the direct American influence operating on a prominent member of the Committee.

The prohibition of all that is not sanctioned, and conversely, that all sanctioned is legal and not subject to the fads and attacks of individual medical officers, is on the whole very advantageous. Although new methods and discoveries are not excluded, since they must first be recognised and adopted, progress will not be much retarded. It is well to emphasise here and now that the regulations do not permit preservatives to be separately introduced in compounding, over and above that already necessarily present in the component raw materials. The greatest publicity also may here be given to the valuable and just recommendation of the Minister of Health, that local authorities should normally first ask for an explanation of an alleged offence before prosecuting.

The authorisations under 6 (1) and (2) for officers to inspect premises and take samples of materials at any time, although drastic, is an entirely necessary reserve power to cope with any possible abuse and the technical difficulties of detection. Similarly, the prohibition against the dipping of meat by retailers cannot possibly be questioned.

The power of instituting independent proceedings under 7, against the offending manufacturer, regardless of where the intermediate sales have taken place, is obviously in the public interest. Under the regulations no warranty defence is provided for.

Other Preservatives

Of the actual selections and exclusions, it is interesting to note the disappearance of the well-tried boron preservatives after a most prolific use. There was adverse pharmacological and theoretical evidence of injuriousness, and there is little doubt that, with a definite proportion of humanity, varied symptoms of indigestion at least arise from boric acid. These people are sufficiently numerous in their idiosyncrasy to receive the protection given, however useful boron products are in some directions, thus for "liquid egg" preserving there is no effective substitute. The strong contrary evidence of harmlessness, where even the workers are subjected to continuous doses of undiluted boron compounds, perhaps represents the normal condition of resistance. Of course, the absorption and accumulation of boron in the system must closely depend on the precise chemical association of food materials, the formation of less soluble calcium compounds, and so on.

The final preference for benzoic acid rather than for salicylic acid, based on certain physiological tests, was apparently decided without regard to the unknown factor of interference caused by the impurities often present in these acids. There is no known scientific reason why cinnamic acid should not be equally harmless and permissible where its solubility makes it useful. Formic acid, of proved harmlessness and reputed very efficient for fruit, might also have received consideration since it occurs naturally. Hydrogen peroxide, too, would be universally considered an ideal preservative.

The restriction to a few preservatives—two in fact—and these to be present one at a time, has undoubtedly been made to give the Public Analyst the most effective control possible. No legal difficulties are to be expected from the small natural occurrences of benzoic and boric acid, which will usually be capable of explanation, even when associated unconsciously with a second added preservative.

The Correct Estimation of Sulphur Dioxide

As a result of a national meeting, on November 17th last, of chemists associated with the Food Manufacturers' Federation and allied interests, it became evident that the measurement of traces of sulphites was in a very inexact state. In consequence, a

group of eight chemists—of which the writer was one—was selected to investigate and perfect practicable methods for typical food products, which could be generally used as standard tests. No doubt at some later date fuller scientific details and evidence will be made available. In the meantime it may be accepted as proved that the main reason for the frequent low results is that of oxidation in the distillation flask—very rapid when hot—to non-volatile sulphuric acid. It would appear that ordinary methods of deaeration—vacuum or recent boiling—will not in themselves prevent all loss. With a metabisulphite control added last to still boiling ultra-deaerated acid water, 97 to 99 per cent. of the theoretical sulphite can be estimated. With many food products such procedure is impossible. The undoubted ineffectiveness of carbon dioxide during distillation practically proves the critical importance of traces of dissolved oxygen, and perhaps of other reactive substances in gelatine, etc., in rapidly accelerating oxidation in solution, even when cold.

Consequently, the practical method of reducing this loss to unimportance is to boil and distil with great speed, using resistant glass flasks.

In order to avoid other sources of loss, the following must be observed:

1. The use of efficient condensation for the products of distillation, and of absorption in the usual oxidisers by proper dispersing traps.

2. The use of a sufficiently high acidity in distillation—in many cases with hydrochloric acid, with a previous caustic soda treatment where necessary—to decompose or disintegrate anything retaining sulphur dioxide.

3. The avoidance of barium loss by correct conditions of precipitation, acidification, etc.

4. The filtration of the distillate.

Volumetric iodine values are, of course, usually too high because of oxidation of other volatile compounds, such as terpenes, and because of volatilisation of iodine.

By attention to these fundamentals and with a little practice, an accuracy within two or three parts per million on every 100 parts of sulphur dioxide present is definitely attainable.

There is still the occasional complication that no distinction has been made from other admixed volatile sulphur compounds, such as hydrogen sulphide of putrefaction and organic sulphides and their decomposition products well known to be present in several condiments (mustard, mint, onions, etc.) in quantities equivalent to 0·18 per cent.

To make the estimations selective in these cases, the use of cold hydrogen peroxide as the oxidant (recommended by A. C. Chapman) rather than iodine or bromine, appears to be very effective.

Fortunately, in very many instances where sulphites are concerned, a sorting test is all that is necessary. By direct titration with iodine a maximum apparent value can often be obtained, by which materials may be classed either as within the legal limit or satisfactory for the purpose in view. In this way distillation can usually be avoided for sugars, glucose, boiled sweets, fondant, canned and dry fruits, jams, and starch. It must be noted, however, that as a rule the "combined" sulphite (aldehydic, ketonic, ester) must first be decomposed by a preliminary digestion with cold sodium hydroxide, followed by acidification and immediate direct titration. Ordinary glucose syrup, for example, may indicate less than half the real sulphite content without alkalisation—although fully broken down by acid distillation—which suggests the extreme probability that these stable sulphite compounds, with sugar, starch, and perhaps cellulose, unoxidised even by iodine and heat resistant, are—as surmised by the 1909 Committee—quite physiologically inert. In this connection it is known that they no longer inhibit moulds.

Our new regulations pay no regard whatever to the probable harmlessness of carbohydrate sulphites, for which many American States have made provision. Moreover, many people appear capable of tolerating large quantities of free sulphur dioxide without known injury, judging by the widespread use of a certain patent medicine some years ago. This is no doubt due to its normally rapid oxidation to harmless sulphate. Little provision appears to have been made for an original sulphur dioxide excess in certain foods and its inference.

So much for the present position as regards methods of estimating preservatives which are now sufficiently accurate and convenient for all practical purposes.

Without touching on the question of colours, enough has already been written to show what a big and complicated subject is the use of preservatives in food. Impossible as it may be to subject all foods and materials to analysis, the regulations clearly demand that a much greater amount of skilled analytical control will in future be required.

Forthcoming Articles

The Herring Industry. W. E. Gibbs, D.Sc., F.I.C.

Wrapping Materials. Dr. Hermann Serger.

The Manufacture of Margarine. P. S. Arup, M.Sc., F.I.C.

Flour as a Raw Material. C. W. Herd, B.Sc., F.I.C.

High Boiled Sweets. R. H. Morgan, B.Sc., A.I.C.

Dried Milk. N. Evers, B.Sc., F.I.C.

Jam Manufacture. H. Mansfield, B.Sc., F.I.C.

Manufacture of Fruit Juice Powders. Dr. H. Lüthje.

Chocolate Manufacture. H. W. Bywaters, D.Sc., Ph.D., F.I.C.

Vitamins. R. F. Hunwicke, B.Sc., A.I.C.

Baby and Invalid Foods. E. H. Callow, B.Sc., Ph.D., A.I.C.

Dermatitis. H. Drake-Law, D.Sc., F.I.C.

Raw Material of the Bacon Curer. F. W. Jackson, B.Sc., A.I.C.

Biscuit Manufacture. Robert Whymper.

Tinplate for Canned Foods. Dr. H. Serger.

Recipes

I.—Jelly Tablet

TO MAKE a good jelly tablet, the following recipe may be advantageously used:

33 lbs. of a really good grade of gelatine are soaked all night in water, and next morning should weigh about 60 to 66 lbs.

The process is started by heating 56 lbs. of glucose in a 40 gallon pan, and, when it boils, adding 112 lbs. of sugar and 3 gallons of water. The whole is thoroughly mixed and boiled.

The wet gelatine is then added, a few sheets at a time, till the whole has dissolved. The pan will need careful stirring during this addition, and the steam pressure will have to be kept at about 30 to 35 lbs. or the gelatine will tend to cake round the sides of the pan; if the pan is slow in boiling an extra gallon of water may be added.

When the gelatine is all dissolved, steam is turned off and 2½ lbs. of citric acid are added, and stirred till dissolved. The mixture is then rubbed through a 30-mesh copper sieve. The colour and essence are added, and the mixture allowed to stand in a separator for an hour, so that the air bubbles may rise to the surface. The clear jelly is then run off from the bottom of the separator into moulds and allowed to set. It can then be cut by machine or hand into the required sizes.

The yield should be about 44 doz. pint squares.

II.—A Recipe for the Manufacture of a Good, Cheap Lemon Cheese

A really reliable article may be made in the following manner:

3 lbs. of dried egg yolk,
3 lbs. of dried egg albumin,
12½ lbs. flour

are each rubbed in a gallon of water and allowed to stand all night. Next morning they are mixed together and strained through a 30-mesh sieve.

The boiling process is as follows: 8 lbs. of margarine (or a mixture of equal parts of butter and margarine may be used with advantage) are melted in a 40-gallon steam pan, and then 56 lbs. of glucose added, and the mixture brought to the boil. Then 70 lbs. of sugar are added and dissolved. Next the egg mixture, produced as above, is stirred in, 1 lb. of salt added, and the whole boiled for a few minutes; then steam is turned off, and 1½ lbs. of citric added and dissolved in the mixture. The whole is then passed through a fine copper sieve and allowed partly to cool.

Finally, 4 ozs. of a really good oil of lemon and about 1 drachm of oil of lime are added; the mixture is suitably coloured with a rich egg-yellow colouring agent and filled into containers before it has had time to cool.

III.—"Puffed" Fruit Fondant

The proportion of the various ingredients can be varied considerably, although the following proportions have been found to give the best results.

Sugar	50 lbs.
Corn syrup	7½ lbs.
Water	10 pints.
Dried fruit, chopped or ground (if fruit is moist, use less) ...	20 lbs.
Chopped walnuts or almonds ...	15 pints.
Baking soda	10 tablespoons.

Cook the sugar, corn syrup, and water to 242° F. (medium soft ball). Add the fruit and nuts. Beat until thick. Add the baking soda and beat until light. Pour on an oiled pan or slab to cool and harden. The candy is improved by chocolate dipping.

W. V. Cruess and A. O'Neill.

IV.—Popcorn—Fruit Crisp

Satisfactory results have been obtained from various combinations of dried fruits and popcorn. A semi-commercial formula is as follows:

Sugar	3 lbs.
Corn syrup	1½ lbs.
Water	1 pint.
Popcorn (popped) ...	4½ quarts.
Butter	3 tablespoons.
Dried fruit, chopped	¾ lb.
Salt	to flavour.

Cook sugar, corn syrup, and water to 285° F. (hard crack). Add the butter, salt, and fruit, and stir. Add and stir in the popcorn. More or less popcorn than that given in the recipe may be added to suit.

K. McLeod.

(*Continued from page* 51.)

Dirs.: A. E. Hutton, 1a, Montana Rd., Tooting, S.W. 17, (clk.).
A. E. Gliddon, 166, Trentham St., Southfields, S.W.
H. F. Pearce, 118, Manor Place, Walworth, S.E.

Qual. of dirs., £250 shs. Remun. of dirs. (except mang. dirs.), £200 each per annum (chairman £250).

Aston Ice and Cold Storage Company, Limited. (221792) Regd. May 13, 1927. Private company. To take over the bus. of ice mnfrs. now cd. on at 12 and 14, Brass Street, Birmingham, as "The Aston Ice and Cold Storage Company." Nom. cap.: £1,500 in £1 shs.

Permt. dirs.: R. W. C. Manton, 42, Edgbaston Road, Moseley, Birmingham.
N. H. Manton, 42, do.
D. L. Manton, 100, Allcroft Road, Hall Green, Birmingham.
J. Stevens, The Cot, Quarry Bank, Worcs.

Qual. of dirs., £100 shs.

Commercial and Legal News

(The Editor does not accept responsibility for any errors which may occur in the following notices.)

Legal News

COLEMAN AND CO'S EXTENSION OF OBJECTS.

MR. JUSTICE EVE in the Chancery Division on May 24th had before him a petition by Coleman and Co., Ltd., to confirm an alteration of the objects of the company.

Mr. Cecil Turner, for the company, said its memorandum was forty years old, and was not so wide in its scope as companies found desirable under modern conditions. The company was a prosperous concern, with a paid-up capital of a quarter of a million. There was no debenture debt, and its reserves exceeded £200,000.

His Lordship: This is to bring the memorandum up to date, really?

Mr. Turner assented, and said the alterations extended the objects to the preparation of all beverages, foodstuffs, and food preparations of all kinds commonly dealt with by grocers. The original business was to deal in an extract called meat and malt wine, and to carry on the business of wholesale and retail druggists and wine merchants. The resolution for the proposed alterations was unanimously passed.

His Lordship confirmed the extension of the company's objects.

London Gazette Information

Joint Stock Companies.

At the expiration of three months from April 22nd, 1927, the undermentioned companies will, unless cause is shown to the contrary, be struck off the Register, and the companies will be dissolved:

Combe Martin Jam and Preserve Co., Ltd.
F. G. Metal Cap and Box Co., Ltd.
Kent Bacon Factory, Ltd.
Riviera Confectionery Co., Ltd.
White Packing Co., Ltd.
Wholesale Machine Supply Co., Ltd.

The undermentioned company was struck off the Register on May 13th, 1927:

Corn Foods, Ltd.

Reduction of Capital.

R. WHITE AND SONS, LTD., and Reduced. The Order of the High Court, Chancery Division, dated April 5th, 1927, confirming the reduction of the capital of this company from £554,000 to £164,000 and the minute approved by the Court showing with respect to the share capital of the company, as altered, the several particulars required by the Act, were registered by the Registrar of Companies on April 21st, 1927.

Voluntary Liquidation.

(Note—Voluntary liquidations may, in some instances, refer to companies in course of reconstruction.)

WINOX, LTD. Resolved, April 12th, that the company be wound up voluntarily, and that E. D. Basden, C.A., 73, Basinghall Street, E.C., be liquidator.

Meeting to Hear Liquidator's Report.

The GENERAL PACKAGE CO., LTD. General meeting of members of this company will be held at offices of the liquidator (N. Bell), 26-27, Bush Lane, Cannon Street, E.C., on June 23rd, at 12 noon.

Bankruptcy Acts, Receiving Orders, Public Examinations, etc.

EXLEY, JAMES EDWARD, and ROWLING, FRED, carrying on business in co-partnership under the style of J. E. EXLEY AND CO., 83, Gibson Street, Leeds Road, Bradford. Pickle manufacturers. Receiving Order, May 6th, 1927. Adjudication, May 6th.

BURFORD, ERNEST ENOCH (junior), trading as E. BURFORD, junior, carrying on business at Alscot Works, Kintore Street, Bermondsey, S.E. Vinegar merchant. Receiving Order, May 3rd, 1927. Creditor's petition. Public examination, 11 a.m. June 22nd, at Bankruptcy Buildings, Carey Street, W.C.

KISSOCK, ALFRED HUGH, and CUTLER, HERBERT BERESFORD, trading and described in the Receiving Order as KISSOCK AND CUTLER, 118, Cannon Street, E.C. Produce importers and brokers. (152 of 1927). Adjudication, April 27th, 1927.

Appointment of Trustee.

JUMP, GEORGES BREMONT, trading as BANKHEAD, HILL, AND CO., 3, Laurence Pountney Hill, E.C. Merchant. (408 of 1927) Trustee: P. S. Booth, Certified Accountant, Kimberley House, Holborn Viaduct, E.C. Appointment dated April 29th, 1927.

Notice of Dividend.

PIKE, STUART NELSON, trading as the SHIRLEY TEA CO., 18, Swan Street, Minories, London. Tea merchant. (688 of 1923) First and final dividend of 7d. per £, payable any day (except Saturday) between 11 a.m. and 2 p.m. at Bankruptcy Buildings, Carey Street, W.C.

New Companies

The undermentioned particulars of New Companies recently registered are taken from the Daily Register compiled by Jordan and Sons, Ltd., Company Registration Agents, 116-118, Chancery Lane, London, W.C.2.

WALLER AND HARTLEY (1927), LIMITED. (221819) Regd. May 13th, 1927. 7, Birley Street, Blackpool. Public Company. To carry on bus. of mnfg. and wholesale confectioners, dlrs. in candies, sugars, and spices; drysalters, etc. Nom. cap.: £80,000 in 120,000 preference shs. of 10s. and 400,000 ordinary shs. of 1s. Minimum subsn.: 7 shares.

(Continued on previous page.)

Current Literature

Fruit and Vegetable Products

The Effect of Acids on Fruit Flavour in Jam, F. S. Morison. (*Canning Age*, March, 1927, 359.)

Lime in the Treatment of Pea Cannery Wastes, L. F. Warrick. (*Canning Age*, March, 1927, 577.)

Fruit Presses. (*Kons. Ind.*, 1927, No 17, 203.)

Effect of Vacuum Distillation on Vitamin Content of Fruit Syrup, E. Jacobsen. (*Kons. Zeit.*, 1927, No. 15, 4.)

Researches on Pectin, H. Eckhart and A. von Gyalôkay. (*Deut. Nahrm.-Rund.*, 1927, No. 8, 69; No. 9, 77.)

Manufacture of Vegetable Products, C. B. Spindler. (*Kons. Zeit.*, 1927, Nos. 17 to 20.)

Manufacture of Jelly and Marmalade, W. V. Cruess. (*Canner*, 1927, Nos. 16, 17, 20.)

Automatic Temperature Control for Jam Kettle, N. C. Schmidt. (*Fruit Prod. Jour.*, April, 1927, 8.)

Recent Investigations on Fig Products, W. V. Cruess. (*Fruit Prod. Jour.*, April, 1927, 10.)

Efficient Tomato Canning, A. W. Bitting. (*Fruit Prod. Jour.*, April, 1927, 13.)

Methods of Canning Figs in California, W. V. Cruess. (*Canner*, 1927, No. 12, 23.)

Storage Temperatures for Canned Fruits, E. F. Kohman and N. H. Sanborn. (*National Canners' Association Bulletin*, No. 23-L.)

Meat and Fish Products

The Preservation of Fishery Products for Food, C. H. Stevenson. (*Bull.* U.S. Fish Commission, 18, 1898, 358-388.)

Die Konservierung von Fischen durch das Gefrierverfahren, R. Plank, E. Ehrenbaum, and K. Reuter, Berlin, 1916.

The Preservation of Food by Freezing with Special Reference to Fish and Meat, W. Stiles. (Special Report No. 7, Food Investigation Board, 1922.)

The Handling and Transport of Fish, E. Griffiths and C. Heron. (Special Report No. 25, Food Investigation Board, 1925.)

The Freezing of Fish on Land and at Sea, J. Piqué. (*Fourth International Congress of Refrigeration*, 1924, 1040.)

Experiments in the Freezing of Fish at the Lorient Cold Stores, M. P. Verriere. (Do., 1060.)

American Improvements in Freezing Fish and Meat, J. J. Barry and C. H. Herter. (Do., 1079.)

Some Practical Results of Fish Freezing according to the Ottesen Patent, K. H. Tusenius. (Do., 1168.)

Modern Fish Freezing, P. W. Petersen. (Do., 1181.)

A Report on the Freezing of Fish, J. M. Bottemanne and D. A. de Jong. (Do., 1211.)

The Influence of Dissolved Salts upon the Physical Properties and Preservative Action of Ice, with Special Reference to the Preservation of Fish, W. E. Gibbs. (Do., 1222.)

The Transport of Provisions in Refrigerated Trucks, M. Poher. (Do., 1274.)

Refrigerator Carriages in France, A. Sigmann. (Do., 1294.)

Refrigerated Transport of Fish by Sea, C. Heron. (Do., 1369.)

Electrical Thawing of Frozen Meat and Fish. (*Eis und Kalte Industrie*, Vienna, March 16, 1923, 21.)

A New Process Perfected for Canning Sardines. (*Canning Age*, April, 1927, 413.)

Confectionery, Cocoa, and Chocolate

Influence of Humidity on Marshmallows. (*Mfg. Conf.*, April, 1927, 34.)

Factors Controlling Uniformity of Marshmallow, E. T. Erickson. (*Mfg. Conf.*, April, 1927, 44.)

Moulding Starch in Blown Chocolate Creams, B. C. Philbrick. (*Jour. Bact.*, vol. 12, 275.)

The Use of Oil of Peppermint in Confectionery, E. Maunier. (*Perfums de France*, vol. 4, 289.)

Cocoa By-Products and their Utilisation, G. P. Walton and R. F. Gardiner. (U.S. Dept. *Agr. Bull.*, 1413.)

The Valuation of Cocoa and Cocoa Products, F. Hartel. (*Zeit. Untersuch. Lebensum.*, vol. 52, 80.)

Various

Studies on Peppermint Oil, L. H. A. Braun. (*Jour. Amer. Pharm. Assoc.*, vol. 15, 337.)

The Speed of Absorption of Moisture by Granulated Sugar, K. K. Shirko-Park-Homemko. (*Zapiski*, vol. 3, 291.)

Report on Eggs and Egg Products, R. Hertwig. (*Jour. Assoc. Official Agr. Chem.*, vol. 9, 348.)

Use of Pure Yeast Cultures, R. O. Brooks. (*Fruit Prod. Jour.*, April, 1927, 17.)

Theory and Practice in Processing, C. O. Ball. (*Canner*, 1927, No. 5, 27.)

Hard, Soft, or Softened Water for Canning Purposes, L. F. Warrick. (*Canner*, 1927, No. 13, 23.)

Vacuum: Its Measurements and Functions in Packing Industry, K. L. Ford. (*Glass Container*, 1927, April, 5.)

Production of Fat by a Species of Penicillium Grown in Sucrose Solution, H. H. Barber. (*Jour. Soc. Chem. Ind.*, 1927, No. 20, 200T.)

Strength of Yeast Cells, S. B. Schryver, E. T. Thomas, and S. G. Paine. (*Jour. Inst. Brew.*, 1927, 33, 120.)

Relation of the Magnesium in the Ash and the Lipoid-protein Ratio to the Quality of Wheats, B. Sullivan and C. Near. (*Jour. Amer. Chem. Soc.*, 1927, 49, 467.)

Fermentable Sugars of Malt, G. S. Wright. (*Jour. Inst. Brew.*, 1927, 33, 151.)

The Value of Lactic Acid in Preservation of Mayonnaise and other Dressings, M. S. Iszard. (*Canning Age*, April, 1927, 434.)

Analysis

The Iodine Number of a Commercial Sardine Oil, M. S. Dunn and B. S. Hollombe. (*Canning Age*, April, 1927, 633.)

Rapid Method for Determination of Starch, O. S. Rask. (*Jour. Assoc. Off. Agric. Chem.*, 1927, 10, 108.)

Relative Sweetening Power of Sucrose and Lævulose, O. Spengler and A. Traegel. (*Zeit. Ver. deut. Zuckerind.*, 1927, 1.)

Ultra-Violet Absorption Spectra of Some Fatty Oils, E. Lewkowitsch. (*Jour. Soc. Chem. Ind.*, 1927, No. 20, 195T.)

Determination of Cuprous Oxide Produced in Sugar Analysis, C. S. Bisson and J. G. Sewell. (*Jour. Assoc. Off. Agric. Chem.*, 1927, 10, 120.)

Apparatus for Electrometric Determination of Ash in Sugar Factory Products, K. Sandera. (*Zeit. Zuckerind. Czechoslov.*, 1927, 51, 205.)

Technique in Testing for Vitamin—B, A. L. Bacharach and G. A. Hartwell. (*Analyst*, 1927, 52, 145.)

Report on the Determination of Food Preservatives, W. W. Randall. (*Jour. Assoc. Official Agr. Chem.*, vol. 9, 358.)

Analysis of Flours, G. Smirich. (*Annali. Chim. Appl.*, 1927, 17, 81.)

Analysis of Egg Yolk Preserved with Glycerin, T. Cockburn and M. Love. (*Analyst*, 1927, 52, 143.)

Determination of Caffeine in De-Caffeinised Coffee, G. Bonifazi. (*Ann. Chim. Analyt.*, 1927, [ii], 9, 33.)

Significance of Solubility and "Activity" of Nitrogen in Cocoa By-Products, G. P. Walton and R. F. Gardiner. (*Jour. Assoc. Off. Agric. Chem.*, 1927, 10, 135.)

Volatile Constituents of Foodstuffs, J. König and W. Schreiber. (*Zeit. Unters. Lebensm.*, 1927, 53, 1.)

Pectins, A. Mehlitz. (*Kolloid-Zeit.*, 1927, 41, 130).

Turbidiscope for Testing Quality of Sugars, K. L. Dern. (*Mfg. Conf.*, April, 1927, 46.)

Application of the Gerber Method for Determination of Fat in Cocoa and Chocolate, J. Ruffy. (*Ann. Chim. Anal. Chim. Appl.*, vol. 8, 225.)

Determination of Milk Fat and Coconut Oil in Cream Bon-Bons, H. Fincke. (*Zeit. Untersuch. Lebensm*, vol. 51, 357.)

Tests for Oil of Anise and Oil of Star Anise. (*Apoth. Ztg.*, vol. 40, 1344.)

The Use of Ultra-Violet Light in Examination of Egg Products, Milk Products, Oils and Fats, etc., G. Popp. (*Zeit. Untersuch. Lebensm.*, vol. 52, 65.)

Report on Methods for Determination of Total Solids in Liquid Eggs and Powdered Dried Eggs, J. C. Palmer. (*Jour. Assoc. Official Agr. Chem.* vol. 9, 354.)

Book Reviews

The Chemical Engineering and Chemical Catalogue. Third Edition. Edited by D. M. Newitt, Ph.D. Pp. 400. 8 ins. x 10 ins. Illustrated. London: Leonard Hill, Ltd. 1927. 15s. net.

The Chemical Engineering and Chemical Catalogue has become a standard work of reference for all concerned in any way with materials, plant, and machinery used in the manufacturing industries. The third edition is larger than its predecessors, and contains several new features, which considerably extend its sphere of utility. As a compendium of practical information, this publication should find a place on the desk of every manufacturer, chemical engineer, and purchaser of materials and equipment used in production.

The catalogue is divided into several sections. The first comprises chemical manufacturers, and contains much useful, practical information as to their products. The second is devoted to engineering firms making plant, machinery, and general equipment, and incidentally gives useful data, condensed and systematically arranged. An index enables one readily to find the names of firms that supply any particular commodity. Following this is a list of trade-marks and trade names, and then an index to industrial applications, which group under trade headings the materials, plant, and so on, with which the various trades are likely to be concerned. Another section gives valuable information on such matters as the chemical resistance of materials of construction; the removal of solid and liquid suspensions from gases; air filtration and spraying; filtration; centrifugal separation; water purification; crushing; grinding; screening; grading; thickening; separating; and steam raising. In addition to this, there are 30 pages of tabulated data relating to subjects like: Refrigeration, combustion, shafting, belting, strength of materials, and thermometry. Finally, the catalogue gives an exhaustive list of technical and scientific books.

Books Received

Industrial Organic Analysis. Second Edition. P. S. Arup. Pp. 471. London: J. and A. Churchill. 1920. 12s. 6d.

Dairy Bacteriology. Orla-Jensen. Translated by P. S. Arup. Pp. 180. London: J. and A. Churchill. 1921. 18s.

Skuse's Complete Confectioner. Eleventh Edition. Pp. 425. London: W. J. Bush and Co., Ltd. 1921. 21s.

Annual Report of the Progress of Applied Chemistry, Vol. XI. 1926. Pp. 724. London: Society of Chemical Industry. 12s. 6d.

Agricultural Yearbook for 1925. United States Department of Agriculture. Pp. 1537. Washington: Govt. Printing Office.

Deutsches Lebensmittel-Taschenbuch. J. Bischoff. Pp. 423. Wittenberg: A. Ziemsen. 1927. 15 R.M.

The Aspergilli. C. Thom and M. B. Church. Pp. 272. London: Baillière, Tindall and Cox. 1926. 22s. 6d.

Enzymes: Properties, Distribution, Methods and Applications. S. A. Waksman and W. C. Davison. Pp. 364. London: Baillière, Tindall and Cox. 1926. 25s.

Recent Patents relating to Food Manufacture and Preserving

The following abstracts are obtained from recently published copies of the "Illustrated Official Journal" (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

266,695. **Preserving crops.** CHEMISCHE FABRIK AUF ACTIEN VORM. E. SCHERING. February 9, 1927. To diminish or to prevent the loss of carbohydrates in plants when stored, the part containing carbohydrate is treated with an agent acting as a narcotic preferably in the form of a vapour or gas. Thus, sliced chicory roots are, whilst still having their greatest content of inulin, treated in an airtight container with about 0·1 per cent. by weight of chloroform.

266,742. **Machines for opening tins.** W. SONNTAG. February 25, 1927 (not yet accepted).
A machine for cutting out the ends of preserve tins.

266,905. **Vitamins.** A. W. OWE. March 2, 1926.
In the process of producing vitamin preparations by saponifying vitamin-bearing fats and lixiviating the resultant soaps with edible fats, to ensure that the soaps are in an undissociated condition during the extraction operation the saponification is effected by an agent free from, or substantially free from, water. Slaked lime substantially free from water may be used to effect the saponification, and after the resulting solid mass has been ground to powder it is digested, for example, with cotton oil.

266,951. **Butter; milk and cream preparations.** M. O'CALLAGHAN. May 27, 1926.
Cream, which has undergone fermentation, is converted into a modified creamy substance, and butter can be made therefrom.

266,967. **Bread.** J. MATTI. June 25, 1926.
Bread is made by intimately mixing 100 parts of flour, 66·5 parts of water, 2 parts of salt, and 1 part of yeast at a temperature of 38-40° C., adding 0·1 parts of an edible neutral fatty substance, such as refined paraffin oil, mechanically kneading the mass for about 12 minutes, allowing it to ferment for about 40 minutes, moulding and allowing it to rise in pans for 15-30 minutes, and finally baking for about 1 hour.

266,980. **Slicing vegetables.** A. BURNETT. July 14, 1926.
A device for slicing vegetables and the like.

267,058. **Sterilising liquids.** W. MATZKA. September 5, 1925.
Liquids are sterilised by bringing them into simultaneous contact with gold and aluminium in electrical connection at a temperature below 60° C., preferably 30-55° C. The process may be applied to fruit juice, or to milk, or to meat extract. [Also 267,377. September 5, 1925.]

267,236. **Beverages.** H. MACKESON. December 14, 1925.
Beverages containing fruit juices, for example, from apples, pears, or grapes, are prepared by adding malt extract to the juice, fermenting, with or without the addition of yeast, filtering and subsequently adding about 4 per cent. of a heated and filtered priming solution containing malt extract, together with a difficultly fermentable carbohydrate, or concentrated fruit juice. The carbohydrate material may be malt extract rich in dextrine, commercial glucose syrup or syrup made by heating sugar or glucose to a temperature short of caramelisation; excess acid in the fruit juice is neutralised with calcium carbonate. The beverage is finally filtered, bottled, and pasteurised in the bottles.

267,307. **Slicing foodstuffs.** C. P. J. HUNT. March 10, 1926.

267,403. **Ice-cream cutting and coating machine.** L. MELLERSH-JACKSON. August 28, 1926.
An ice-cream cutting and coating machine is provided with means for automatically cutting off portions from an ice-cream block, placing them on a rotating carrier, coating them with a confection such as chocolate, removing the coated portions from the carrier, and delivering them to a discharge shoot ready for wrapping and storing.

267,410. **Vitamins.** H. ISCOVESCO AND A. B. ADAMS. September 17, 1926.
Substances rich in vitamins are produced by saponifying residues from cod livers after the oil has been extracted, extracting the unsaponified materials with an organic solvent such as acetone, or sulphuric ether, and then separating the solvent from the extracted material. The residues may be either cod-liver pulps from which the oil has been extracted, or the dense whitish material carrying crystalline inclusions which settles to the bottom of the cod-liver oil containers during the clarification of the first extracts. The saponified mass is dried at low temperature and then pulverised before treatment with the solvent. The concentrate may be directly incorporated into food or it may be dissolved in a liquid and then mixed with the food. Thus, in making margarine the concentrate may be added to the melted fat mass; cholesterine may also be added. For adding the concentrate to foods such as biscuits, syrup, marmalade, candy products, honey, flour, etc., and to cattle and poultry foodstuffs, it is first dissolved in a solvent such as glycerine. Specifications 208,145 and 220,697 are referred to.